MuPDFCore

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Chapter 1

MuPDFCore: Multiplatform .NET bindings for MuPDF

MuPDFCore is a set of multiplatform .NET bindings for `MuPDF`. It can render PDF, XPS, EPUB and other formats to raster images returned either as raw bytes, or as image files in multiple formats (including PNG and PSD). It also supports multithreading.

It also includes **MuPDFCore.MuPDFRenderer**, an Avalonia control to display documents compatible with MuPDFCore in Avalonia windows (with multithreaded rendering).

The library is released under the `AGPLv3` licence.

1.1 Getting started

The MuPDFCore library targets .NET Standard 2.0, thus it can be used in projects that target .NET Standard 2.0+, .NET Core 2.0+, .NET 5.0+, .NET Framework 4.6.1 (note) and possibly others. MuPDFCore includes a pre-compiled native library, which currently supports the following platforms:

- Windows x86 (32 bit)
- Windows x64 (64 bit)
- Windows arm64 (ARM 64 bit)
- Linux x64 (64 bit)
- Linux arm64/aarch64 (ARM 64 bit)
- macOS Intel x86_64 (64 bit)
- macOS Apple silicon (ARM 64 bit)

To use the library in your project, you should install the `MuPDFCore NuGet package` and/or the `MuPDFCore.PDFRenderer NuGet package`. When you publish a program that uses MuPDFCore, the correct native library for the target architecture will automatically be copied to the build folder (but see the note for .NET Framework).

Note: you should make sure that end users on Windows install the `Microsoft Visual C++ Redistributable for Visual Studio 2015, 2017, 2019 and 2022` for their platform, otherwise they will get an error message stating that `MuPDFWrapper.dll` could not be loaded because a module was not found.

1.2 Usage

1.2.1 Documentation

Interactive documentation for the library can be accessed from the documentation website. A PDF reference manual is also available.

1.2.2 Examples

The Demo folder in the repository contains some examples of how the library can be used to extract pages from a PDF or XPS document, render them to a raster image, or combine them in a new document

The PDFViewerDemo folder contains a complete (though minimal) example of a PDF viewer program built around the MuPDFCore.MuPDFRenderer.PDFRenderer control.

Note that these examples intentionally avoid any error handling code: in a production setting, you should typically make sure that calls to MuPDFCore library functions are within a `try...catch` block to handle any resulting MuPDFExceptions.

1.2.3 MuPDFCore library

The first step when using MuPDFCore is to create a MuPDFCore.MuPDFContext object that is used internally by the MuPDF library to store various things:

```
MuPDFContext context = new MuPDFContext();
```

This object is IDisposable, therefore you should always call the Dispose() method on it once you are done with it (or, better yet, wrap it in a `using` directive). In most instances, you will only need one instance of MuPDFContext for your whole application.

Amongst other things, MuPDF uses this context to store a cache of "assets" (e.g. images or fonts) that have been used while rendering documents and that may be needed in future. This requires some memory: by default, the maximum size of this cache store is 256MB; however, if you want to restrict how much memory can be used, you can alter this by providing a `long` value to constructor, indicating the size in bites for the store. A value of `0` means that the store can grow up to an unlimited size. Furthermore, you can clear the cache completely by using the MuPDFContext.ClearCache method, or partially by using the MuPDFContext.ShrinkCache method.

Once you have obtained a MuPDFContext, you can use it to open a MuPDFDocument. A document can be opened from a file on disk:

```
MuPDFDocument document = new MuPDFDocument(context, "path/to/file");
```

Or from a `byte[]` array (in this case, you will have to specify the format of the document):

```
byte[] data;
...
MuPDFDocument document = new MuPDFDocument(context, data, InputFileTypes.PDF);
```

Or from a MemoryStream (in this case too, you will have to specify the format of the document):

```
MemoryStream stream;
...
MuPDFDocument document = new MuPDFDocument(context, ref stream, InputFileTypes.PDF);
```

The MemoryStream is passed with the `ref` keyword to indicate that the MuPDFDocument will take care of appropriately disposing it once it finishes using it.

A MuPDFDocument is also IDisposable and should be properly disposed of to avoid memory leaks.

Important note: the constructor taking a `byte[]` and the one taking a `MemoryStream` will not copy the data bytes before sending them to the native MuPDF library functions. Rather, they will *pin them in place*. This is a **bad thing** because it will mess up with the Garbage Collector's management of memory. Therefore, this is only suitable for short-lived objects. If you need to initialise a long-lived document object from memory, you should first copy the data to unmanaged memory and then use one of the constructors that take an `IntPtr` parameter, e.g.:

```
byte[] data;
...
//Allocate enough unmanaged memory
IntPtr ptr = Marshal.AllocHGlobal(data.Length);
//Copy the byte array to unmanaged memory
Marshal.Copy(data, 0, ptr, data.Length);
//Wrap the pointer in an IDisposable
IDisposable dispIntPtr = new DisposableIntPtr(ptr);
//Create the document
MuPDFDocument document = new MuPDFDocument(ctx, ptr, data.Length, InputFileTypes.PDF, ref dispIntPtr);
```

The `DisposableIntPtr` class is a wrapper around a pointer that calls `Marshal.FreeHGlobal` on it once it is disposed. Passing it as the final optional parameter of `MuPDFDocument` constructor (again by reference, to indicate that the document takes ownership of the object) makes sure that the memory is properly freed once the document is disposed.

After having obtained a document, you can do many things with it: for example, you can render a page and save the results to a file on disk, or you can collect multiple pages and combine them in a new document. Code to do this can be found in the `Program.cs` file of the Demo project.

Furthermore, you can render a page directly to memory:

```
byte[] pixelData = document.Render(0, 1, PixelFormats.RGBA);
```

This method renders page 0 (i.e. the first page of the document) at a 1x resolution (1pt in the document is equivalent to 1px in the image), preserving alpha (transparency) information, and returns the image as an array of the bytes that constitute the pixel data (four bytes per pixel). A variation of this method allows you to supply a rectangular region of the page that you would like to render, rather than the whole page.

Alternatively, if you already know where the image data should be put (e.g. because you are using some kind of graphics library that lets you manipulate the pixel data of its images), you can use the methods that take an `IntPtr` destination:

```
IntPtr destination;
...
document.Render(0, 1, PixelFormats.RGBA, destination);
```

In this case, **you have to make sure that there is enough memory to hold the resulting image**! Otherwise, an `AccessViolationException` will occur and your program will usually fail catastrophically. Since it may sometimes be hard to determine how much memory a particular image will need (especially because of subtle differences in the rounding routines, which can cause images to be 1px larger or shorter than expected), the `GetRenderedSize` method is provided, which returns the number of bytes that will be needed to render a certain page. For example:

```
//Get the number of bytes that will be necessary to hold the rendered page at the given resolution.
int sizeInBytes = document.GetRenderedSize(0, 1, PixelFormats.RGBA);
//Allocate an appropriate amount of memory.
IntPtr destination = Marshal.AllocHGlobal(sizeInBytes);
//Again, we use a DisposableIntPtr to make sure that we are freeing the memory when we are done with it.
using (DisposableIntPtr holder = new DisposableIntPtr(destination))
{
    //Make sure that all the parameters match those of the call to GetRenderedSize, or the size of the
    //resulting image may be different than expected! Even a translation of 1px could have catastrophic
    //consequences.
    document.Render(0, 1, PixelFormats.RGBA, destination);
}
```

Finally, **none of these methods are inherently thread-safe**! E.g. you cannot render multiple pages of the same document (nor multiple regions of a single page) by simply performing multiple calls to `MuPDFDocument.Render` in parallel. For multi-threaded operation, you must instead use a `MuPDFMultiThreadedPageRender`. You can obtain one from a document:

```
MuPDFMultiThreadedPageRenderer renderer = document.GetMultiThreadedRenderer(0, 2);
```

This method obtains an object that can be used to render the first page of the document using two threads. By using the `Render` method of this object, the page can be rendered. The page will be rendered to a number of separate tiles equal to the number of threads, which will then be your responsibility to appropriately "stitch up" (e.g. if you

want to display them on screen, you could just place them appropriately). The size of each tile (and the position it should occupy) can be computed by using the `Split` method of the `RoundedSize` struct.

Furthermore, multiple `MuPDFMultiThreadedPageRenderer`s can be used in parallel, which makes it possible e.g. to render every page in the document at the same time (while also using multiple threads to render each page). The following example will render all the pages in a document at the same time in RGBA format at a 1.5x zoom, using 2 threads for each page:

```
//Create a MuPDFContext with a using statement, so that it gets disposed at the right time.
using MuPDFContext context = new MuPDFContext();
//Open the document also with a using statement.
using MuPDFDocument document = new MuPDFDocument(context, "path/to/file.pdf");
//Create arrays to hold the objects for the various pages
//Renderers: one per page
MuPDFMultiThreadedPageRenderer[] renderers = new MuPDFMultiThreadedPageRenderer[document.Pages.Count];
//Page size: one per page
RoundedSize[] renderedPageSizes = new RoundedSize[document.Pages.Count];
//Boundaries of the tiles that make up each page: one array per page, with one element per thread
RoundedRectangle[][] tileBounds = new RoundedRectangle[document.Pages.Count][];
//Addresses of the memory areas where the image data of the tiles will be stored: one array per page, with
       one element per thread
IntPtr[][] destinations = new IntPtr[document.Pages.Count][];
//Cycle through the pages in the document to initialise everything
for (int i = 0; i < document.Pages.Count; i++)
{
    //Initialise the renderer for the current page, using two threads (total number of threads: number of
       pages x 2
    renderers[i] = document.GetMultiThreadedRenderer(i, 2);
    //Determine the boundaries of the page when it is rendered with a 1.5x zoom factor
    RoundedRectangle roundedBounds = document.Pages[i].Bounds.Round(1.5);
    renderedPageSizes[i] = new RoundedSize(roundedBounds.Width, roundedBounds.Height);
    //Determine the boundaries of each tile by splitting the total size of the page by the number of
       threads.
    tileBounds[i] = renderedPageSizes[i].Split(renderers[i].ThreadCount);
    destinations[i] = new IntPtr[renderers[i].ThreadCount];
    for (int j = 0; j < renderers[i].ThreadCount; j++)
    {
        //Allocate the required memory for the j-th tile of the i-th page.
        //Since we will be rendering with a 24-bit-per-pixel format, the required memory in bytes is height
       x width x 3.
        destinations[i][j] = Marshal.AllocHGlobal(tileBounds[i][j].Height * tileBounds[i][j].Width * 3);
    }
}
//Start the actual rendering operations in parallel.
Parallel.For(0, document.Pages.Count, i =>
{
    renderers[i].Render(renderedPageSizes[i], document.Pages[i].Bounds, destinations[i], PixelFormats.RGB);
});
//The code in this for-loop is not really part of MuPDFCore - it just shows an example of using VectSharp to
       "stitch" the tiles up and produce the full image.
for (int i = 0; i < document.Pages.Count; i++)
{
    //Create a new (empty) image to hold the whole page.
    VectSharp.Page renderedPage = new VectSharp.Page(renderedPageSizes[i].Width,
       renderedPageSizes[i].Height);
    //Draw each tile onto the image.
    for (int j = 0; j < renderers[i].ThreadCount; j++)
    {
        //Create a raster image object containing the pixel data. Yay, we do not need to copy/marshal
       anything!
        VectSharp.RasterImage tile = new VectSharp.RasterImage(destinations[i][j], tileBounds[i][j].Width,
       tileBounds[i][j].Height, false, false);
        //Draw the tile on the main image page.
        renderedPage.Graphics.DrawRasterImage(tileBounds[i][j].X0, tileBounds[i][j].Y0, tile);
    }
    //Save the full page as a PNG image.
    renderedPage.SaveAsPNG("page" + i.ToString() + ".png");
}
//Clean-up code.
for (int i = 0; i < document.Pages.Count; i++)
{
    //Release the allocated memory.
    for (int j = 0; j < renderers[i].ThreadCount; j++)
    {
        Marshal.FreeHGlobal(destinations[i][j]);
    }
    //Release the renderer (if you skip this, the quiescent renderer's threads will not be stopped, and your
       application will never exit!
    renderers[i].Dispose();
}
```

1.2.4 Structured text representation

The GetStructuredTextPage method of the MuPDFDocument class makes it possible to obtain a "structured text" representation of each page of the document. This consists of a MuPDFStructuredTextPage object, which is a collection of 0 or more MuPDFStructuredTextBlocks.

Each MuPDFStructuredTextBlock either represents an image or a block of text, typically a paragraph (though there is no guarantee that this is the case). MuPDFStructuredTextBlocks are themselves collections of MuPDFStructuredTextLines, and each line is a collection of MuPDFStructuredTextCharacters (in the case of a block representing an image, it will contain a single line with a single character).

MuPDFStructuredTextBlocks and MuPDFStructuredTextLines have a BoundingBox property that defines a rectangle (in page units) that bounds the contents of the block/line in the page. Similarly, MuPDFStructuredTextCharacters have a BoundingQuad (rather than being a Rectangle, this is a Quad, i.e. a quadrilater defined by its four vertices, which may or may not be a rectangle). These can be used e.g. to highlight regions of text in the page.

The MuPDFStructuredTextPage also has methods to determine which character contains or is closest to a specified point (useful, for example, to determine on which character the user clicked), to obtain a list of shapes that encompass a specified range of text, and to perform text searches using regular expressions.

The order of the blocks in the page (which affects the definition of a "range" of text and search operations) is the same as returned by the underlying MuPDF library, which is taken from the order the text is drawn in the source file, so may not be accurate. They can be reordered using the Array.Sort method on the StructuredTextBlocks array contained in the MuPDFStructuredTextPage (lines within blocks and characters within lines can be likewise reordered).

1.2.5 Optical Character Recognition (OCR) using Tesseract

MuPDF 1.18+ (embedded in MuPDFCore 1.3.0+) adds support for OCR using the Tesseract library. To access this feature in MuPDFCore, you can use one of the overloads of GetStructuredTextPage that takes a TesseractLanguage argument specifying the language to use for the OCR. This will run the OCR and return a MuPDFStructuredTextPage containing the character information obtained by Tesseract, which can be used normally. Depending on the model being used, the OCR step can take a relatively long time; therefore, the MuPDFDocument class also implements a GetStructuredTextPageAsync method, which does the same thing in an asynchronous way. The GetStructuredTextPageAsync method also has optional parameters to report the OCR progress and to make it possible to cancel its execution.

Objects of the TesseractLanguage class contain information used to locate the trained language model file that is used by Tesseract. Normally, when using Tesseract, you would have to ensure that the trained language model files are available on the user's computer; however, this class implements some "clever" logic to download the necessary files on demand.

In general, MuPDF provides Tesseract with a "language name" (e.g. "eng"). Tesseract then looks for a file called eng.traineddata either in the folder specified by the TESSDATA_PREFIX environment variable, or, if the variable is not defined, in a subfolder of the current working directory called tessdata. MuPDFCore manipulates the value of TESSDATA_PREFIX (at the process level) and the language name in order to specify the language file.

The TesseractLanguage class has multiple constructors:

- TesseractLanguage(string prefix, string language): this constructor is used to directly specify the value of TESSDATA_PREFIX and the language name. The library does not process these in any way. If prefix is null, the value of TESSDATA_PREFIX is not changed, and Tesseract uses the system value.

- `TesseractLanguage(string fileName)`: with this constructor, you can directly specify the path to a trained language model file. You can obtain such a file from the tessdata_fast repository or from the tessdata_best repository. If the file does not have a `.traineddata` extension, it will be copied in a temporary location.

- `TesseractLanguage(Fast language, bool useAnyCached = false)` \ `TesseractLanguage(FastScript language, bool useAnyCached = false)` \ `TesseractLanguage(Best language, bool useAnyCached = false)` \ `TesseractLanguage(BestScript language, bool useAnyCached = false)`

  With these constructors, you can specify a language from the list of available languages defined in the `TesseractLanguage.Fast`, `TesseractLanguage.FastScript`, `TesseractLanguage.Best`, and `TesseractLanguage.BestScript` enums.

  MuPDFCore will then look for the trained model file corresponding to the selected language, relative to the *path of the executable*, in a folder called `tessdata/fast` and then in a folder called `fast` (or `best`, depending on the overload; for the overloads taking a script name, it looks in `tessdata/fast/script` or `fast/script` instead).

  If the language file is not found in either of these folders, it then looks for it in a subfolder called `tessdata/fast` in `Environment.SpecialFolder.LocalApplicationData`. If the optional argument `useAnyCached` is `true`, it also looks for the language file in the same folder as the executable, and then in the `best` (or `fast`) subfolders. In this case, for example, if the language file for `TesseractLanguage.Fast.Eng` is not available, but the file for `TesseractLanguage.Best.Eng` is available, the latter will be used.

  Finally, if the language file could not be found in any of the possible paths, MuPDFCore will download it from the appropriate repository and place it in the appropriate subfolder of the `tessdata` folder in `Environment.SpecialFolder.LocalApplicationData`. The file will then be reused as necessary.

  The `TESSDATA_PREFIX` and language name will then be set accordingly to where the file was located.

  This means that if you use one of these constructors you do not have to worry about the language files being installed in the right place; as long as the user has an Internet connection, the library will download the language files as necessary.

1.2.6 MuPDFCore.MuPDFRenderer control

To use the `PDFRenderer` control in an Avalonia application, first of all you need to add it to you Avalonia `Window`, e.g. in the XAML:

```
<Window xmlns="https://github.com/avaloniaui"
        ...
        xmlns:mupdf="clr-namespace:MuPDFCore.MuPDFRenderer;assembly=MuPDFCore.MuPDFRenderer"
        Opened="WindowOpened"
        ... >
    <mupdf:PDFRenderer Name="MuPDFRenderer" />
</Window>
```

You then need to initialise it from the backing code, e.g. in a `WindowOpened` event:

```
private void WindowOpened(object sender, EventArgs e)
{
    this.FindControl<PDFRenderer>("MuPDFRenderer").Initialize("path/to/file.pdf");
}
```

This way, the renderer will start showing the first page of the specified document, using a number of rendering threads that is decided based on the number of processors in the computer. There are many other ways to initialise a PDFRenderer, so make sure to look at the documentation to see the other possibilities!

1.3 Building from source

Building the MuPDFCore library from source requires the following steps:

1. Building the `libmupdf` native library
2. Building the `MuPDFWrapper` native library
3. Creating the `MuPDFCore` library NuGet package

Steps 1 and 2 need to be performed on all of Windows, macOS and Linux, and on the various possible architectures (x86, x64 and arm64 for Windows, x64/Intel and arm64/Apple for macOS, and x64 and arm64 for Linux - no cross-compiling)! Otherwise, some native assets will be missing and it will not be possible to build the NuGet package.

1.3.1 1. Building libmupdf

You can download the open-source (GNU AGPL) MuPDF source code from `here`. You will need to uncompress the source file and compile the library on Windows, macOS and Linux. You need the following files:

- From Windows (x86, x64, arm64):
  - libmupdf.lib
- From macOS (Intel - x64, Apple silicon - arm64):
  - libmupdf.a
  - libmupdf-third.a
- From Linux (x64, arm64):
  - libmupdf.a
  - libmupdf-third.a

Note that the files from macOS and Linux are different, despite sharing the same name.

For convenience, these compiled files for MuPDF 1.19.1 are included in the `native/MuPDFWrapper/lib folder` of this repository.

1.3.1.1 Tips for compiling MuPDF 1.20.0:

- On all platforms:
  - You do not need to follow the instructions in `thirdparty/tesseract.txt`, as in this version the *leptonica* and *tesseract* libraries are already included in the source archive.
  - Delete or comment line 316 in `source/fitz/output.c` (the `fz_throw` invocation within the `buffer_seek` method - this should leave the `buffer_seek` method empty). This line throws an exception when a seek operation on a buffer is attempted. The problem is that this makes it impossible to render a document as a PSD image in memory, because the `fz_write_pixmap_as_psd` method performs a few seek operations. By removing this line, we turn buffer seeks into no-ops; this doesn't seem to have catastrophic side-effects and the PSD documents produced in this way appear to be fine.
- On Windows (x64):
  - Open the `platform/win32/mupdf.sln` solution in Visual Studio. You should get a prompt to retarget your projects. Accept the default settings (latest Windows SDK and v143 of the tools).
  - Select the `ReleaseTesseract` configuration and `x64` architecture. Select every project in the solution except `javaviewer` and `javaviewerlib` and right-click to open the project properties. Go to `C/C++ > Code Generation` and set the `Runtime Library` to `Multi-threaded DLL (/MD)`. Save everything (`CTRL+SHIFT+S`) and close Visual Studio.

  - Now, open the `x64 Native Tools Command Prompt for VS`, move to the folder with the solution file, and build it using `msbuild mupdf.sln`
  - Then, build again using `msbuild mupdf.sln /p:Configuration=Release`. Ignore the compilation errors.
  - Finally, build again using `msbuild mupdf.sln /p:Configuration=ReleaseTesseract`.
  - This may still show some errors, but should produce the `libmupdf.lib` file that is required in the `x64/ReleaseTesseract` folder (the file should be ~441MB in size).

- On Windows (x86):
  - You will have to use Visual Studio 2019, as Visual Studio 2022 is not supported on x86 platforms.
  - Open the `platform/win32/mupdf.sln` solution in Visual Studio and select the `Release↩Tesseract` configuration and `Win32` architecture. Select every project in the solution except `javaviewer` and `javaviewerlib` and right-click to open the project properties. Go to `C/C++ > Code Generation` and set the `Runtime Library` to `Multi-threaded DLL (/MD)`. Save everything (`CTRL+SHIFT+S`) and close Visual Studio.
  - Now, open the `x86 Native Tools Command Prompt for VS`, move to the folder with the solution file, and build it using `msbuild mupdf.sln /p:Platform=Win32`
  - Then, build again using `msbuild mupdf.sln /p:Configuration=Release /p↩:Platform=Win32`. Ignore the compilation errors.
  - Finally, build again using `msbuild mupdf.sln /p:Configuration=ReleaseTesseract /p:Platform=Win32`.
  - This may still show some errors, but should produce the `libmupdf.lib` file that is required in the `ReleaseTesseract` folder (the file should be ~362MB in size).

- On Windows (arm64)

  This is going to be a bit more complicated, because it appears that MuPDF is not meant to be built on ARM. These instructions will assume that you are building MuPDF on an ARM machine.

  First of all, make sure that you have installed Visual Studio 2022 and have selected the C++ ARM64 build tools component of the "Desktop development with C++" workload.

  Note: When you install Visual Studio on an ARM machine, it will complain that this is not supported and will be slow. Ignore that warning.

  - Download and extract the MuPDF source code and follow the instructions for all platforms above.
  - Add `|| defined(_M_ARM64)` at the end of line 16 in `scripts/tesseract/endianness.h`.
  - Now we need to edit a few files in the `thirdparty/tesseract/src/arch` folder.
    * Comment or delete lines 149-177 (inclusive) in `simddetect.cpp`. You should now have an empty block between `# elif defined(_WIN32)` and `#else`. Also comment or delete lines 198-220 (inclusive) and 237-260 (inclusive).
    * Comment or delete lines 20-22 (inclusive) in `dotproductsse.cpp`. Replace the whole body of the `DotProductSSE` method (lines 30-76) with `return DotProductNative(u, v, n);`.
    * Comment or delete lines 20-21 (inclusive) in `dotproductavx.cpp`. Replace the whole body of the `DotProductAVX` method (lines 29-54) with `return DotProductNative(u, v, n);`.
    * Comment or delete lines 20-21 (inclusive) in `dotproductfma.cpp`. Replace the whole body of the `DotProductFMA` method (lines 29-52) with `return DotProductNative(u, v, n);`.
    * Delete the contents of `thirdparty/tesseract/src/arch/intsimdmatrixavx2.↩cpp` and `thirdparty/tesseract/src/arch/intsimdmatrixsse.cpp` (do not delete the files, just their contents).
    * Comment or delete lines 120-121 (inclusive) in `intsimdmatrix.h`
  - Open the `platform/win32/mupdf.sln` solution in Visual Studio. You should get a prompt to retarget your projects. Accept the default settings (latest Windows SDK and v143 of the tools).

  - In Visual Studio, click on the "Configuration Manager" item from the "Build" menu. In the new window, click on the drop down menu for the "Active solution platform" and select <New...>. In this new dialog, select the ARM64 platform and choose to copy the settings from x64. Leave the Create new project platforms option enabled and click on OK (this may take some time).
  - Close the Configuration Manager and select the ReleaseTesseract configuration and ARM64 architecture. Select every project in the solution except javaviewer and javaviewerlib and right-click to open the project properties. Go to C/C++ > Code Generation and set the Runtime Library to Multi-threaded DLL (/MD).
  - Open the properties for the libpkcs7 project, go to C/C++ > Preprocessor and remove HAVE_LIBCRYPTO from the Preprocessor Definitions. Then go to Librarian > General and remove libcrypto.lib from the Additional Dependencies.
  - Save everything (CTRL+SHIFT+S) and close Visual Studio.
  - Create a new folder platform/win32/Release. Now, the problem is that the bin2coff script included with MuPDF cannot create obj files for ARM64 (only for x86 and x64). Since I could not find a version that can do this, I translated the source code of bin2coff to C# and added this option myself. You can download an ARM64 bin2coff.exe from here; place it in the Release folder that you have just created.
  - Open the Developer Command Prompt for VS, move to the folder with the solution file (platform/win32), and build it using msbuild mupdf.sln /p:Configuration=ReleaseTesseract. Some compilation errors may occur towards the end, but they should not matter.
  - After a while, this should produce libmupdf.lib in the ARM64/ReleaseTesseract folder (the file should be ~444MB in size).

- On Linux (x64):
  - Edit the Makefile, adding the -fPIC compiler option at the end of line 24 (which specifies the CFLAGS).
  - Make sure that you are using a recent enough version of GCC (version 7.3.1 seems to be enough).
  - Compile by running USE_TESSERACT=yes make HAVE_X11=no HAVE_GLUT=no (this builds just the command-line libraries and tools, and enables OCR through the included Tesseract library).

- On Linux (arm64):
  - Edit the Makefile, adding the -fPIC compiler option at the end of line 24 (which specifies the CFLAGS).
  - Delete or comment line 218 in thirdparty/tesseract/src/arch/simddetect.cpp.
  - Make sure that you are using a recent enough version of GCC (version 7.3.1 seems to be enough).
  - Compile by running USE_TESSERACT=yes make HAVE_X11=no HAVE_GLUT=no (this builds just the command-line libraries and tools, and enables OCR through the included Tesseract library).

- On macOS (Intel - x64):
  - Edit the Makefile, adding the -fPIC compiler option at the end of line 24 (which specifies the CFLAGS). Also add the -std=c++11 option at the end of line 58 (which specifies the CXX_CMD).
  - Compile by running USE_TESSERACT=yes make (this enables OCR through the included Tesseract library).

- On macOS (Apple silicon - arm64)
  - Edit the Makefile, adding the -fPIC compiler options at the end of line 24 (which specifies the CFLAGS). Also add the -std=c++11 option at the end of line 58 (which specifies the CXX_CMD).
  - Delete or comment line 218 in thirdparty/tesseract/src/arch/simddetect.cpp.
  - Compile by running USE_TESSERACT=yes make (this enables OCR through the included Tesseract library).

1.3.2 2. Building MuPDFWrapper

Once you have the required static library files, you should download the MuPDFCore source code: MuPDFCore-1.4.0.tar.gz (or clone the repository) and place the library files in the appropriate subdirectories in the native/MuPDFWrapper/lib/ folder.

To compile MuPDFWrapper you will need CMake (version 3.8 or higher) and (on Windows) Ninja.

On Windows, the easiest way to get all the required tools is probably to install Visual Studio. By selecting the "Desktop development with C++" workload you should get everything you need.

On macOS, you will need to install at least the Command-Line Tools for Xcode (if necessary, you should be prompted to do this while you perform the following steps) and CMake.

Once you have everything at the ready, you will have to build MuPDFWrapper on the seven platforms.

1.3.2.1 Windows (x86 and x64)

1.

Assuming you have installed Visual Studio, you should open the "x64 Native Tools Command Prompt for VS" or the "x86 Native Tools Command Prompt for VS" (you should be able to find these in the Start menu). Take care to open the version corresponding to the architecture you are building for, otherwise you will not be able to compile the library. A normal command prompt will not work, either.

Note 1: you **must** build the library on two separate systems, one running a 32-bit version of Windows and the other running a 64-bit version. If you try to build the x86 library on an x64 system, the system will probably build a 64-bit library and place it in the 32-bit output folder, which will just make things very confusing.

Note 2 for Windows x86: for some reason, Visual Studio might install the 64-bit version of CMake and Ninja, even though you are on a 32-bit machine. If this happens, you will have to manually install the 32-bit CMake and compile a 32-bit version of Ninja. You will notice if this is an issue because the 64-bit programs will refuse to run.

1. CD to the directory where you have downloaded the MuPDFCore source code.
2. CD into the native directory.
3. Type build. This will start the build.cmd batch script that will delete any previous build and compile the library.

After this finishes, you should find a file named MuPDFWrapper.dll in the native/out/build/win-x64/MuPDFWrapper/ directory or in the native/out/build/win-x86/MuPDFWrapper/ directory. Leave it there.

1.3.2.2 Windows (arm64)

1. Locate the batch file that sets up the developer command prompt environment. You can do this by finding the "Developer Command Prompt for VS" link in the start menu, then clicking on Open file location, opening the properties of the link and looking at the Target. This could be e.g. C:\Program Files\Microsoft Visual Studio\2022\Preview\Common7\Tools\VsDevCmd.bat.
2. Open a normal command prompt and invoke the batch script with the -arch=arm64 -host_arch=x86 arguments (add quotes if there are spaces in the path to the batch script), e.g.:
```
"C:\Program Files\Microsoft Visual Studio\2022\Preview\Common7\Tools\VsDevCmd.bat" -arch=arm64
 -host_arch=x86
```
3. CD to the directory where you have downloaded the MuPDFCore source code.
4. CD into the native directory.
5. Type build. This will start the build.cmd batch script that will delete any previous build and compile the library.

After this finishes, you should find a file named MuPDFWrapper.dll in the native/out/build/win-arm64/MuPDFWrapper/ directory. Leave it there.

1.3.2.3 macOS and Linux

1. Assuming you have everything ready, open a terminal in the folder where you have downloaded the MuPDFCore source code.
2. `cd` into the `native` directory.
3. Type `chmod +x build.sh`.
4. Type `./build.sh`. This will delete any previous build and compile the library.

After this finishes, you should find a file named `libMuPDFWrapper.dylib` in the `native/out/build/mac-x64/MuPDFWrapper/` directory (on macOS running on an Intel x64 processor) or in the `native/out/build/mac-arm64/MuPDFWrapper/` directory (on macOS running on an Apple silicon arm64 processor), and a file named `libMuPDFWrapper.so` in the `native/out/build/linux-x64/MuPDFWrapper/` directory (on Linux). Leave it there.

1.3.3 3. Creating the MuPDFCore NuGet package

Once you have the `MuPDFWrapper.dll`, `libMuPDFWrapper.dylib` and `libMuPDFWrapper.so` files, make sure they are in the correct folders (`native/out/build/xxx-yyy/MuPDFWrapper/`), **all on the same machine**.

To create the MuPDFCore NuGet package, you will need the `.NET Core 2.0 SDK or higher` for your platform. Once you have installed it and have everything ready, open a terminal in the folder where you have downloaded the MuPDFCore source code and type:

```
cd MuPDFCore
dotnet pack -c Release
```

This will create a NuGet package in `MuPDFCore/bin/Release`. You can install this package on your projects by adding a local NuGet source.

1.3.4 4. Running tests

To verify that everything is working correctly, you should build the MuPDFCore test suite and run it on all platforms. To build the test suite, you will need the `.NET 6 SDK or higher`. You will also need to have enabled the `Windows Subsystem for Linux`.

To build the test suite:

1. Make sure that you have changed the version of the MuPDFCore NuGet package so that it is higher than the latest version of MuPDFCore in the NuGet repository (you should use a pre-release suffix, e.g. `1.4.0-a1` to avoid future headaches with new versions of MuPDFCore). This is set in line 9 of the `MuPDFCore/MuPDFCore.csproj` file.
2. Add the `MuPDFCore/bin/Release` folder to your local NuGet repositories (you can do this e.g. in Visual Studio).
3. If you have not done so already, create the MuPDFCore NuGet package following step 3 above.
4. Update line 56 of the `Tests/Tests.csproj` project file so that it refers to the version of the MuPDFCore package you have just created.

These steps ensure that you are testing the right version of MuPDFCore (i.e. your freshly built copy) and not something else that may have been cached.

Now, open a windows command line in the folder where you have downloaded the MuPDFCore source code, type `BuildTests` and press `Enter`. This will create a number of files in the `Release\MuPDFCoreTests` folder, where each file is an archive containing the tests for a certain platform and architecture:

- `MuPDFCoreTests-linux-x64.tar.gz` contains the tests for Linux environments on x64 processors.
- `MuPDFCoreTests-linux-arm64.tar.gz` contains the tests for Linux environments on arm64 processors.
- `MuPDFCoreTests-mac-x64.tar.gz` contains the tests for macOS environments on Intel processors.
- `MuPDFCoreTests-mac-arm64.tar.gz` contains the tests for macOS environments on Apple silicon processors.
- `MuPDFCoreTests-win-x64.tar.gz` contains the tests for Windows environments on x64 processors.
- `MuPDFCoreTests-win-x86.tar.gz` contains the tests for Windows environments on x86 processors.

To run the tests, copy each archive to a machine running the corresponding operating system, and extract it (note: on Windows, the default zip file manager may struggle when extracting the text file with non-latin characters; you may need to manually extract this file). Then:

1.3.4.1 Windows

- Open a command prompt and `CD` into the folder where you have extracted the contents of the test archive.
- Enter the command `MuPDFCoreTestHost` (this will run the test program).

1.3.4.2 macOS and Linux

- Open a terminal and `cd` into the folder where you have extracted the contents of the test archive.
- Enter the command `chmod +x MuPDFCoreTestHost` (this will add the executable flag to the test program).
- Enter the command `./MuPDFCoreTestHost` (this will run the test program).
- On macOS, depending on your security settings, you may get a message saying `zsh: killed` when you try to run the program. To address this, you need to sign the executable, e.g. by running `codesign --timestamp --sign <certificate> MuPDFCoreTestHost`, where `<certificate>` is the name of a code signing certificate in your keychain (e.g. `Developer ID Application: John Smith`). After this, you can try again to run the test program with `./MuPDFCoreTestHost`.

The test suite will start; it will print the name of each test, followed by a green `Succeeded` or a red `Failed` depending on the test result. If everything went correctly, all tests should succeed.

When all the tests have been run, the program will print a summary showing how many tests have succeeded (if any) and how many have failed (if any). If any tests have failed, a list of these will be printed, and then they will be run again one at a time, waiting for a key press before running each test (this makes it easier to follow what is going on). If you wish to kill the test process early, you can do so with `CTRL+C`.

1.4 Note about MuPDFCore and .NET Framework

If you wish to use MuPDFCore in a .NET Framework project, you will need to manually copy the native MuPDFWrapper library for the platform you are using to the executable directory (this is done automatically if you target .NET/.NET core).

One way to obtain the appropriate library files is:

1. Manually download the NuGet package for `MuPDFCore` (click on the "Download package" link on the right).
2. Rename the `.nupkg` file so that it has a `.zip` extension.
3. Extract the zip file.
4. Within the extracted folder, the library files are in the `runtimes/xxx/native/` folder, where `xxx` is `linux-x64`, `linux-arm64`, `osx-x64`, `osx-arm64`, `win-x64`, `win-x86` or `win-arm64`, depending on the platform you are using.

Make sure you copy the appropriate file to the same folder as the executable!

Chapter 2

Namespace Index

2.1 Package List

Here are the packages with brief descriptions (if available):

Chapter 3

Hierarchical Index

3.1 Class Hierarchy

This inheritance list is sorted roughly, but not completely, alphabetically:

Chapter 4

Class Index

4.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

Chapter 5

File Index

5.1 File List

Here is a list of all documented files with brief descriptions:

Chapter 6

Namespace Documentation

6.1 Avalonia Namespace Reference

6.2 Avalonia.Animation Namespace Reference

Classes

- class RectTransition

  Transition class that handles AvaloniaProperty with Rect types.

6.3 MuPDFCore Namespace Reference

Classes

- class DisposableIntPtr

  An IDisposable wrapper around an IntPtr that frees the allocated memory when it is disposed.
- class DocumentLockedException

  The exception that is thrown when an attempt is made to render an encrypted document without supplying the required password.
- class MessageEventArgs

  EventArgs for the MuPDF.StandardOutputMessage and MuPDF.StandardErrorMessage events.
- class MuPDF

  Contains static methods to perform setup operations.
- class MuPDFContext

  A wrapper around a MuPDF context object, which contains the exception stack and the resource cache store.
- class MuPDFDocument

  A wrapper over a MuPDF document object, which contains possibly multiple pages.
- class MuPDFException

  The exception that is thrown when a MuPDF operation fails.
- class MuPDFImageStructuredTextBlock

  Represents a block containing a single image. The block contains a single line with a single character.
- class MuPDFMultiThreadedPageRenderer

  A class that holds the necessary resources to render a page of a MuPDF document using multiple threads.

- class MuPDFPage

  A wrapper over a MuPDF page object, which contains information about the page's boundaries.
- class MuPDFPageCollection

  A lazy collection of MuPDFPages. Each page is loaded from the document as it is requested for the first time.
- struct MuPDFStructuredTextAddress

  Represents the address of a particular character in a MuPDFStructuredTextPage, in terms of block index, line index and character index.
- class MuPDFStructuredTextAddressSpan

  Represents a range of characters in a MuPDFStructuredTextPage.
- class MuPDFStructuredTextBlock

  Represents a structured text block containing text or an image.
- class MuPDFStructuredTextCharacter

  Represents a single text character.
- class MuPDFStructuredTextLine

  Represents a single line of text (i.e. characters that share a common baseline).
- class MuPDFStructuredTextPage

  Represents a structured representation of the text contained in a page.
- class MuPDFTextStructuredTextBlock

  Represents a block containing multiple lines of text (typically a paragraph).
- class OCRProgressInfo

  Describes OCR progress.
- struct PointF

  Represents a point.
- struct Quad

  Represents a quadrilater (not necessarily a rectangle).
- struct Rectangle

  Represents a rectangle.
- class RenderProgress

  Holds a summary of the progress of the current rendering operation.
- struct RoundedRectangle

  Represents a rectangle using only integer numbers.
- struct RoundedSize

  Represents the size of a rectangle using only integer numbers.
- struct Size

  Represents the size of a rectangle.
- class TesseractLanguage

  Represents a language used by Tesseract OCR.

Enumerations

- enum ExitCodes {
  ERR_CANNOT_CREATE_CONTEXT = 129 , ERR_CANNOT_REGISTER_HANDLERS = 130 ,
  ERR_CANNOT_OPEN_FILE = 131 , ERR_CANNOT_COUNT_PAGES = 132 ,
  ERR_CANNOT_RENDER = 134 , ERR_CANNOT_OPEN_STREAM = 135 , ERR_CANNOT_LOAD_PAGE
  = 136 , ERR_CANNOT_COMPUTE_BOUNDS = 137 ,
  ERR_CANNOT_INIT_MUTEX = 138 , ERR_CANNOT_CLONE_CONTEXT = 139 , ERR_CANNOT_SAVE =
  140 , ERR_CANNOT_CREATE_BUFFER = 141 ,
  ERR_CANNOT_CREATE_WRITER = 142 , ERR_CANNOT_CLOSE_DOCUMENT = 143 , ERR_CANNOT_CREATE_PAGE
  = 144 , ERR_CANNOT_POPULATE_PAGE = 145 ,
  EXIT_SUCCESS = 0 }

  Exit codes returned by native methods describing various errors that can occur.

- enum InputFileTypes {
  PDF = 0 , XPS = 1 , CBZ = 2 , PNG = 3 ,
  JPEG = 4 , BMP = 5 , GIF = 6 , TIFF = 7 ,
  PNM = 8 , PAM = 9 , EPUB = 10 , FB2 = 11 }

  File types supported in input by the library.
- enum RasterOutputFileTypes { PNM = 0 , PAM = 1 , PNG = 2 , PSD = 3 }

  Raster image file types supported in output by the library.
- enum DocumentOutputFileTypes { PDF = 0 , SVG = 1 , CBZ = 2 }

  Document file types supported in output by the library.
- enum PixelFormats { RGB = 0 , RGBA = 1 , BGR = 2 , BGRA = 3 }

  Pixel formats supported by the library.
- enum EncryptionState { Unencrypted = 0 , Encrypted = 1 , Unlocked = 2 }

  Possible document encryption states.
- enum RestrictionState { Unrestricted = 0 , Restricted = 1 , Unlocked = 2 }

  Possible document restriction states.
- enum DocumentRestrictions {
  None = 0 , Print = 1 , Copy = 2 , Edit = 4 ,
  Annotate = 8 }

  Document restrictions.
- enum PasswordTypes { None = 0 , User = 1 , Owner = 2 }

  Password types.

6.3.1 Enumeration Type Documentation

6.3.1.1 DocumentOutputFileTypes

`enum MuPDFCore.DocumentOutputFileTypes`

Document file types supported in output by the library.

Enumerator

PDF	Portable Document Format.
SVG	Scalable Vector Graphics.
CBZ	Comic book archive format.

Definition at line 214 of file MuPDF.cs.

6.3.1.2 DocumentRestrictions

`enum MuPDFCore.DocumentRestrictions`

Document restrictions.

Enumerator

None	No operation is restricted.
Print	Printing the document is restricted.
Copy	Copying the document is restricted.
Edit	Editing the document is restricted.
Annotate	Annotating the document is restricted.

Definition at line 303 of file MuPDF.cs.

6.3.1.3 EncryptionState

`enum MuPDFCore.EncryptionState`

Possible document encryption states.

Enumerator

Unencrypted	The document is not encrypted.
Encrypted	The document is encrypted and a user password is necessary to render it.
Unlocked	The document is encrypted and the correct user password has been supplied.

Definition at line 261 of file MuPDF.cs.

6.3.1.4 ExitCodes

`enum MuPDFCore.ExitCodes`

Exit codes returned by native methods describing various errors that can occur.

Enumerator

ERR_CANNOT_CREATE_CONTEXT	An error occurred while creating the context object.
ERR_CANNOT_REGISTER_HANDLERS	An error occurred while registering the default document handlers with the context.
ERR_CANNOT_OPEN_FILE	An error occurred while opening a file.
ERR_CANNOT_COUNT_PAGES	An error occurred while determining the total number of pages in the document.
ERR_CANNOT_RENDER	An error occurred while rendering the page.
ERR_CANNOT_OPEN_STREAM	An error occurred while opening the stream.
ERR_CANNOT_LOAD_PAGE	An error occurred while loading the page.
ERR_CANNOT_COMPUTE_BOUNDS	An error occurred while computing the page bounds.
ERR_CANNOT_INIT_MUTEX	An error occurred while initialising the mutexes for the lock mechanism.
ERR_CANNOT_CLONE_CONTEXT	An error occurred while cloning the context.

Enumerator

ERR_CANNOT_SAVE	An error occurred while saving the page to a raster image file.
ERR_CANNOT_CREATE_BUFFER	An error occurred while creating the output buffer.
ERR_CANNOT_CREATE_WRITER	An error occurred while creating the document writer.
ERR_CANNOT_CLOSE_DOCUMENT	An error occurred while finalising the document file.
ERR_CANNOT_CREATE_PAGE	An error occurred while creating an empty structured text page.
ERR_CANNOT_POPULATE_PAGE	An error occurred while populating the structured text page
EXIT_SUCCESS	No error occurred. All is well.

Definition at line 31 of file MuPDF.cs.

6.3.1.5 InputFileTypes

`enum MuPDFCore.InputFileTypes`

File types supported in input by the library.

Enumerator

PDF	Portable Document Format.
XPS	XML Paper Specification document.
CBZ	Comic book archive file (ZIP archive containing page scans).
PNG	Portable Network Graphics format.
JPEG	Joint Photographic Experts Group image.
BMP	Bitmap image.
GIF	Graphics Interchange Format.
TIFF	Tagged Image File Format.
PNM	Portable aNyMap graphics format.
PAM	Portable Arbitrary Map graphics format.
EPUB	Electronic PUBlication document.
FB2	FictionBook document.

Definition at line 122 of file MuPDF.cs.

6.3.1.6 PasswordTypes

`enum MuPDFCore.PasswordTypes`

Password types.

Enumerator

None	No password.
User	The password corresponds to the user password.
Owner	The password corresponds to the owner password.

Definition at line 334 of file MuPDF.cs.

6.3.1.7 PixelFormats

enum MuPDFCore.PixelFormats

Pixel formats supported by the library.

Enumerator

RGB	24bpp RGB format.
RGBA	32bpp RGBA format.
BGR	24bpp BGR format.
BGRA	32bpp BGRA format.

Definition at line 235 of file MuPDF.cs.

6.3.1.8 RasterOutputFileTypes

enum MuPDFCore.RasterOutputFileTypes

Raster image file types supported in output by the library.

Enumerator

PNM	Portable aNyMap graphics format.
PAM	Portable Arbitrary Map graphics format.
PNG	Portable Network Graphics format.
PSD	PhotoShop Document format.

Definition at line 188 of file MuPDF.cs.

6.3.1.9 RestrictionState

enum MuPDFCore.RestrictionState

Possible document restriction states.

Enumerator

Unrestricted	The document does not have any restrictions associated to it.
Restricted	Some restrictions apply to the document. An owner password is required to remove these restrictions.
Unlocked	The document had some restrictions and the correct owner password has been supplied.

Definition at line 282 of file MuPDF.cs.

6.4 MuPDFCore.MuPDFRenderer Namespace Reference

Classes

- class PDFRenderer

  A control to render PDF documents (and other formats), potentally using multiple threads.

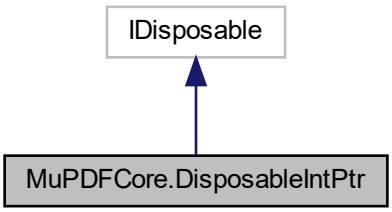
Chapter 7

Class Documentation

7.1 MuPDFCore.DisposableIntPtr Class Reference

An IDisposable wrapper around an IntPtr that frees the allocated memory when it is disposed.

Inheritance diagram for MuPDFCore.DisposableIntPtr:



Public Member Functions

- DisposableIntPtr (IntPtr pointer)

  Create a new DisposableIntPtr.
- DisposableIntPtr (IntPtr pointer, long bytesAllocated)

  Create a new DisposableIntPtr, adding memory pressure to the GC to account for the allocation of unmanaged memory.
- void Dispose ()

7.1.1 Detailed Description

An IDisposable wrapper around an IntPtr that frees the allocated memory when it is disposed.

Definition at line 406 of file MuPDF.cs.

7.1.2 Constructor & Destructor Documentation

7.1.2.1 DisposableIntPtr() [1/2]

```
MuPDFCore.DisposableIntPtr.DisposableIntPtr (
            IntPtr pointer )
```

Create a new DisposableIntPtr.

Parameters

pointer	The pointer that should be freed upon disposing of this object.

Definition at line 422 of file MuPDF.cs.

7.1.2.2 DisposableIntPtr() [2/2]

```
MuPDFCore.DisposableIntPtr.DisposableIntPtr (
            IntPtr pointer,
            long bytesAllocated )
```

Create a new DisposableIntPtr, adding memory pressure to the GC to account for the allocation of unmanaged memory.

Parameters

pointer	The pointer that should be freed upon disposing of this object.
bytesAllocated	The number of bytes that have been allocated, for adding memory pressure.

Definition at line 432 of file MuPDF.cs.

7.1.3 Member Function Documentation

7.1.3.1 Dispose()

```
void MuPDFCore.DisposableIntPtr.Dispose ( )
```

Definition at line 468 of file MuPDF.cs.

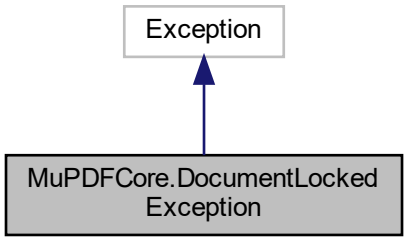
The documentation for this class was generated from the following file:

- MuPDFCore/MuPDF.cs

7.2 MuPDFCore.DocumentLockedException Class Reference

The exception that is thrown when an attempt is made to render an encrypted document without supplying the required password.

Inheritance diagram for MuPDFCore.DocumentLockedException:



7.2.1 Detailed Description

The exception that is thrown when an attempt is made to render an encrypted document without supplying the required password.

Definition at line 494 of file MuPDF.cs.

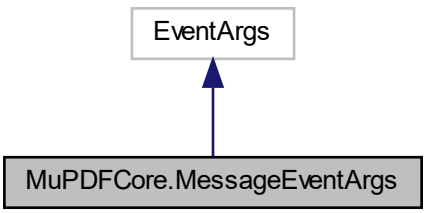
The documentation for this class was generated from the following file:

- MuPDFCore/MuPDF.cs

7.3 MuPDFCore.MessageEventArgs Class Reference

EventArgs for the MuPDF.StandardOutputMessage and MuPDF.StandardErrorMessage events.

Inheritance diagram for MuPDFCore.MessageEventArgs:



Public Member Functions

- MessageEventArgs (string message)

  Create a new MessageEventArgs instance.

Properties

- string Message [get]

  The message that has been logged.

7.3.1 Detailed Description

EventArgs for the MuPDF.StandardOutputMessage and MuPDF.StandardErrorMessage events.

Definition at line 550 of file MuPDF.cs.

7.3.2 Constructor & Destructor Documentation

7.3.2.1 MessageEventArgs()

```
MuPDFCore.MessageEventArgs.MessageEventArgs (
            string message )
```

Create a new MessageEventArgs instance.

Parameters

message	The message that has been logged.

Definition at line 561 of file MuPDF.cs.

7.3.3 Property Documentation

7.3.3.1 Message

```
string MuPDFCore.MessageEventArgs.Message [get]
```

The message that has been logged.

Definition at line 555 of file MuPDF.cs.

The documentation for this class was generated from the following file:

- MuPDFCore/MuPDF.cs

7.4 MuPDFCore.MuPDF Class Reference

Contains static methods to perform setup operations.

Static Public Member Functions

- static async Task RedirectOutput ()

  Redirects output messages from the native MuPDF library to the StandardOutputMessage and StandardErrorMessage events. Note that this has side-effects.
- static void ResetOutput ()

  Reset the default standard output and error streams for the native MuPDF library.

Events

- static EventHandler< MessageEventArgs > StandardOutputMessage

  This event is invoked when RedirectOutput has been called and the native MuPDF library writes to the standard output stream.
- static EventHandler< MessageEventArgs > StandardErrorMessage

  This event is invoked when RedirectOutput has been called and the native MuPDF library writes to the standard error stream.

7.4.1 Detailed Description

Contains static methods to perform setup operations.

Definition at line 570 of file MuPDF.cs.

7.4.2 Member Function Documentation

7.4.2.1 RedirectOutput()

```
static async Task MuPDFCore.MuPDF.RedirectOutput ( )  [static]
```

Redirects output messages from the native MuPDF library to the StandardOutputMessage and StandardErrorMessage events. Note that this has side-effects.

Returns

A Task that finishes when the output streams have been redirected.

Definition at line 599 of file MuPDF.cs.

7.4.2.2 ResetOutput()

```
static void MuPDFCore.MuPDF.ResetOutput ( )  [static]
```

Reset the default standard output and error streams for the native MuPDF library.

Definition at line 819 of file MuPDF.cs.

7.4.3 Event Documentation

7.4.3.1 StandardErrorMessage

```
EventHandler<MessageEventArgs> MuPDFCore.MuPDF.StandardErrorMessage  [static]
```

This event is invoked when RedirectOutput has been called and the native MuPDF library writes to the standard error stream.

Definition at line 593 of file MuPDF.cs.

7.4.3.2 StandardOutputMessage

```
EventHandler<MessageEventArgs> MuPDFCore.MuPDF.StandardOutputMessage  [static]
```

This event is invoked when RedirectOutput has been called and the native MuPDF library writes to the standard output stream.

Definition at line 588 of file MuPDF.cs.

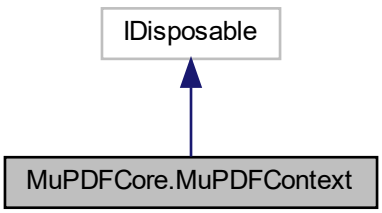
The documentation for this class was generated from the following file:

- MuPDFCore/MuPDF.cs

7.5 MuPDFCore.MuPDFContext Class Reference

A wrapper around a MuPDF context object, which contains the exception stack and the resource cache store.

Inheritance diagram for MuPDFCore.MuPDFContext:



Public Member Functions

- MuPDFContext (uint storeSize=256<< 20)

  Create a new MuPDFContext instance with the specified cache store size.
- void ClearStore ()

  Evict all items from the resource cache store (freeing the memory where they were held).
- void ShrinkStore (double fraction)

  Evict items from the resource cache store (freeing the memory where they were held) until the the size of the store drops to the specified fraction of the current size.
- void Dispose ()

Properties

- long StoreSize [get]

  The current size in bytes of the resource cache store. Read-only.
- long StoreMaxSize [get]

  The maximum size in bytes of the resource cache store. Read-only.

7.5.1 Detailed Description

A wrapper around a MuPDF context object, which contains the exception stack and the resource cache store.

Definition at line 25 of file MuPDFContext.cs.

7.5.2 Constructor & Destructor Documentation

7.5.2.1 MuPDFContext()

```
MuPDFCore.MuPDFContext.MuPDFContext (
            uint storeSize = 256 << 20 )
```

Create a new MuPDFContext instance with the specified cache store size.

Parameters

storeSize	The maximum size in bytes of the resource cache store. The default value is 256 MiB.

Definition at line 58 of file MuPDFContext.cs.

7.5.3 Member Function Documentation

7.5.3.1 ClearStore()

```
void MuPDFCore.MuPDFContext.ClearStore ( )
```

Evict all items from the resource cache store (freeing the memory where they were held).

Definition at line 87 of file MuPDFContext.cs.

7.5.3.2 Dispose()

```
void MuPDFCore.MuPDFContext.Dispose ( )
```

Definition at line 132 of file MuPDFContext.cs.

7.5.3.3 ShrinkStore()

```
void MuPDFCore.MuPDFContext.ShrinkStore (
            double fraction )
```

Evict items from the resource cache store (freeing the memory where they were held) until the the size of the store drops to the specified fraction of the current size.

Parameters

fraction	The fraction of the current size that constitutes the target size of the store. If this is <= 0, the cache is cleared. If this is >= 1, nothing happens.

Definition at line 96 of file MuPDFContext.cs.

7.5.4 Property Documentation

7.5.4.1 StoreMaxSize

```
long MuPDFCore.MuPDFContext.StoreMaxSize  [get]
```

The maximum size in bytes of the resource cache store. Read-only.

Definition at line 46 of file MuPDFContext.cs.

7.5.4.2 StoreSize

```
long MuPDFCore.MuPDFContext.StoreSize  [get]
```

The current size in bytes of the resource cache store. Read-only.

Definition at line 35 of file MuPDFContext.cs.

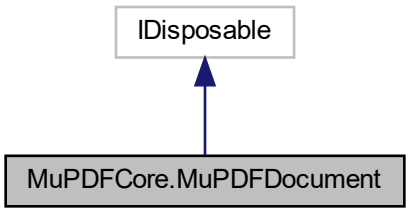
The documentation for this class was generated from the following file:

- MuPDFCore/MuPDFContext.cs

7.6 MuPDFCore.MuPDFDocument Class Reference

A wrapper over a MuPDF document object, which contains possibly multiple pages.

Inheritance diagram for MuPDFCore.MuPDFDocument:



Public Member Functions

- MuPDFDocument (MuPDFContext context, IntPtr dataAddress, long dataLength, InputFileTypes fileType)

  Create a new MuPDFDocument from data bytes accessible through the specified pointer.
- MuPDFDocument (MuPDFContext context, IntPtr dataAddress, long dataLength, InputFileTypes fileType, ref IDisposable dataHolder)

  Create a new MuPDFDocument from data bytes accessible through the specified pointer.
- MuPDFDocument (MuPDFContext context, byte[ ] data, InputFileTypes fileType)

  Create a new MuPDFDocument from an array of bytes.
- MuPDFDocument (MuPDFContext context, ref MemoryStream data, InputFileTypes fileType)

  Create a new MuPDFDocument from a MemoryStream.
- MuPDFDocument (MuPDFContext context, string fileName)

  Create a new MuPDFDocument from a file.
- void ClearCache ()

  Discard all the display lists that have been loaded from the document, possibly freeing some memory in the case of a huge document.
- byte[ ] Render (int pageNumber, Rectangle region, double zoom, PixelFormats pixelFormat, bool include↩ Annotations=true)

Render (part of) a page to an array of bytes.

- byte[ ] Render (int pageNumber, double zoom, PixelFormats pixelFormat, bool includeAnnotations=true)

  Render a page to an array of bytes.
- void Render (int pageNumber, Rectangle region, double zoom, PixelFormats pixelFormat, IntPtr destination, bool includeAnnotations=true)

  Render (part of) a page to the specified destination.
- void Render (int pageNumber, double zoom, PixelFormats pixelFormat, IntPtr destination, bool include↩ Annotations=true)

  Render a page to the specified destination.
- Span< byte > Render (int pageNumber, Rectangle region, double zoom, PixelFormats pixelFormat, out IDisposable disposable, bool includeAnnotations=true)

  Render (part of) a page to a Span<byte>.
- Span< byte > Render (int pageNumber, double zoom, PixelFormats pixelFormat, out IDisposable disposable, bool includeAnnotations=true)

  Render a page to a Span<byte>.
- MuPDFMultiThreadedPageRenderer GetMultiThreadedRenderer (int pageNumber, int threadCount, bool includeAnnotations=true)

  Create a new MuPDFMultiThreadedPageRenderer that renders the specified page with the specified number of threads.
- int GetRenderedSize (int pageNumber, double zoom, PixelFormats pixelFormat)

  Determine how many bytes will be necessary to render the specified page at the specified zoom level, using the the specified pixel format.
- void SaveImage (int pageNumber, Rectangle region, double zoom, PixelFormats pixelFormat, string file↩ Name, RasterOutputFileTypes fileType, bool includeAnnotations=true)

  Save (part of) a page to an image file in the specified format.
- void SaveImage (int pageNumber, double zoom, PixelFormats pixelFormat, string fileName, RasterOutputFileTypes fileType, bool includeAnnotations=true)

  Save a page to an image file in the specified format.
- void WriteImage (int pageNumber, Rectangle region, double zoom, PixelFormats pixelFormat, Stream outputStream, RasterOutputFileTypes fileType, bool includeAnnotations=true)

  Write (part of) a page to an image stream in the specified format.
- void WriteImage (int pageNumber, double zoom, PixelFormats pixelFormat, Stream outputStream, RasterOutputFileTypes fileType, bool includeAnnotations=true)

  Write a page to an image stream in the specified format.
- MuPDFStructuredTextPage GetStructuredTextPage (int pageNumber, bool includeAnnotations=true)

  Creates a new MuPDFStructuredTextPage from the specified page. This contains information about the text layout that can be used for highlighting and searching. The reading order is taken from the order the text is drawn in the source file, so may not be accurate.
- MuPDFStructuredTextPage GetStructuredTextPage (int pageNumber, TesseractLanguage ocrLanguage, bool includeAnnotations=true, CancellationToken cancellationToken=default, IProgress< OCRProgressInfo > progress=null)

  Creates a new MuPDFStructuredTextPage from the specified page, using optical character recognition (OCR) to determine what text is written on the image. This contains information about the text layout that can be used for highlighting and searching.
- async Task< MuPDFStructuredTextPage > GetStructuredTextPageAsync (int pageNumber, TesseractLanguage ocrLanguage, bool includeAnnotations=true, CancellationToken cancellationToken=default, IProgress< OCRProgressInfo > progress=null)

  Creates a new MuPDFStructuredTextPage from the specified page, using optical character recognition (OCR) to determine what text is written on the image. This contains information about the text layout that can be used for highlighting and searching. The OCR step is run asynchronously, e.g. to avoid blocking the UI thread.
- string ExtractText (string separator=null, bool includeAnnotations=true)

  Extracts all the text from the document and returns it as a string. The reading order is taken from the order the text is drawn in the source file, so may not be accurate.
- string ExtractText (TesseractLanguage ocrLanguage, string separator=null, bool includeAnnotations=true)

Extracts all the text from the document and returns it as a string, using optical character recognition (OCR) to determine what text is written on the image.

- async Task< string > ExtractTextAsync (TesseractLanguage ocrLanguage, string separator=null, bool includeAnnotations=true, CancellationToken cancellationToken=default, IProgress< OCRProgressInfo > progress=null)

  Extracts all the text from the document and returns it as a string, using optical character recognition (OCR) to determine what text is written on the image. The OCR step is run asynchronously, e.g. to avoid blocking the UI thread.
- bool TryUnlock (string password)

  Attempts to unlock the document with the supplied password.
- bool TryUnlock (string password, out PasswordTypes passwordType)

  Attempts to unlock the document with the supplied password.
- void Dispose ()

Static Public Member Functions

- static int GetRenderedSize (Rectangle region, double zoom, PixelFormats pixelFormat)

  Determine how many bytes will be necessary to render the specified region in page units at the specified zoom level, using the the specified pixel format.
- static void CreateDocument (MuPDFContext context, string fileName, DocumentOutputFileTypes fileType, bool includeAnnotations=true, params(MuPDFPage page, Rectangle region, float zoom)[ ] pages)

  Create a new document containing the specified (parts of) pages from other documents.
- static void CreateDocument (MuPDFContext context, string fileName, DocumentOutputFileTypes fileType, bool includeAnnotations=true, params MuPDFPage[ ] pages)

  Create a new document containing the specified pages from other documents.

Properties

- MuPDFPageCollection Pages `[get]`

  The pages contained in the document.
- bool ClipToPageBounds = true `[get, set]`

  Defines whether the images resulting from rendering operations should be clipped to the page boundaries.
- EncryptionState EncryptionState `[get]`

  Describes the encryption state of the document.
- RestrictionState RestrictionState `[get]`

  Describes the restriction state of the document.
- DocumentRestrictions Restrictions `[get]`

  Describes the operations that are restricted on the document. This is not actually enforced by the library, but library users should only allow these operations if the document has been unlocked with the owner password (i.e. if RestrictionState is RestrictionState.Unlocked).

7.6.1 Detailed Description

A wrapper over a MuPDF document object, which contains possibly multiple pages.

Definition at line 30 of file MuPDFDocument.cs.

7.6.2 Constructor & Destructor Documentation

7.6.2.1 MuPDFDocument() [1/5]

```
MuPDFCore.MuPDFDocument.MuPDFDocument (
            MuPDFContext context,
            IntPtr dataAddress,
            long dataLength,
            InputFileTypes fileType )
```

Create a new MuPDFDocument from data bytes accessible through the specified pointer.

Parameters

context	The context that will own this document.
dataAddress	A pointer to the data bytes that make up the document.
dataLength	The number of bytes to read from the specified address.
fileType	The type of the document to read.

Definition at line 135 of file MuPDFDocument.cs.

7.6.2.2 MuPDFDocument() [2/5]

```
MuPDFCore.MuPDFDocument.MuPDFDocument (
            MuPDFContext context,
            IntPtr dataAddress,
            long dataLength,
            InputFileTypes fileType,
            ref IDisposable dataHolder )
```

Create a new MuPDFDocument from data bytes accessible through the specified pointer.

Parameters

context	The context that will own this document.
dataAddress	A pointer to the data bytes that make up the document.
dataLength	The number of bytes to read from the specified address.
fileType	The type of the document to read.
dataHolder	An IDisposable that will be disposed when the MuPDFDocument is disposed.

Definition at line 145 of file MuPDFDocument.cs.

7.6.2.3 MuPDFDocument() [3/5]

```
MuPDFCore.MuPDFDocument.MuPDFDocument (
            MuPDFContext context,
            byte[] data,
            InputFileTypes fileType )
```

Create a new MuPDFDocument from an array of bytes.

Parameters

context	The context that will own this document.
data	An array containing the data bytes that make up the document. This must not be altered until after the MuPDFDocument has been disposed! The address of the array will be pinned, which may cause degradation in the Garbage Collector's performance, and is thus only advised for short-lived documents. To avoid this issue, marshal the bytes to unmanaged memory and use one of the IntPtr constructors.
fileType	The type of the document to read.

Definition at line 245 of file MuPDFDocument.cs.

7.6.2.4 MuPDFDocument() [4/5]

```
MuPDFCore.MuPDFDocument.MuPDFDocument (
            MuPDFContext context,
            ref MemoryStream data,
            InputFileTypes fileType )
```

Create a new MuPDFDocument from a MemoryStream.

Parameters

context	The context that will own this document.
data	The MemoryStream containing the data that makes up the document. This will be disposed when the MuPDFDocument has been disposed and must not be disposed externally! The address of the MemoryStream's buffer will be pinned, which may cause degradation in the Garbage Collector's performance, and is thus only advised for short-lived documents. To avoid this issue, marshal the bytes to unmanaged memory and use one of the IntPtr constructors.
fileType	The type of the document to read.

Definition at line 347 of file MuPDFDocument.cs.

7.6.2.5 MuPDFDocument() [5/5]

```
MuPDFCore.MuPDFDocument.MuPDFDocument (
            MuPDFContext context,
            string fileName )
```

Create a new MuPDFDocument from a file.

Parameters

context	The context that will own this document.
fileName	The path to the file to open.

Definition at line 453 of file MuPDFDocument.cs.

7.6.3 Member Function Documentation

7.6.3.1 ClearCache()

```
void MuPDFCore.MuPDFDocument.ClearCache ( )
```

Discard all the display lists that have been loaded from the document, possibly freeing some memory in the case of a huge document.

Definition at line 584 of file MuPDFDocument.cs.

7.6.3.2 CreateDocument() [1/2]

```
static void MuPDFCore.MuPDFDocument.CreateDocument (
            MuPDFContext context,
            string fileName,
            DocumentOutputFileTypes fileType,
            bool includeAnnotations = true,
            params MuPDFPage[] pages )  [static]
```

Create a new document containing the specified pages from other documents.

Parameters

context	The context that was used to open the documents.
fileName	The output file name.
fileType	The output file format.
pages	The pages to include in the document.
includeAnnotations	If this is `true`, annotations (e.g. signatures) are included in the display list that is generated. Otherwise, only the page contents are included.

Definition at line 1135 of file MuPDFDocument.cs.

7.6.3.3 CreateDocument() [2/2]

```
static void MuPDFCore.MuPDFDocument.CreateDocument (
            MuPDFContext context,
            string fileName,
            DocumentOutputFileTypes fileType,
```

```
bool includeAnnotations = true,
params(MuPDFPage page, Rectangle region, float zoom)[] pages )  [static]
```

Create a new document containing the specified (parts of) pages from other documents.

Parameters

context	The context that was used to open the documents.
fileName	The output file name.
fileType	The output file format.
includeAnnotations	If this is `true`, annotations (e.g. signatures) are included in the display list that is generated. Otherwise, only the page contents are included.
pages	The pages to include in the document. The "page" element specifies the page, the "region" element the area of the page that should be included in the document, and the "zoom" element how much the region should be scaled.

Definition at line 1027 of file MuPDFDocument.cs.

7.6.3.4 Dispose()

```
void MuPDFCore.MuPDFDocument.Dispose ( )
```

Definition at line 1494 of file MuPDFDocument.cs.

7.6.3.5 ExtractText() [1/2]

```
string MuPDFCore.MuPDFDocument.ExtractText (
            string separator = null,
            bool includeAnnotations = true )
```

Extracts all the text from the document and returns it as a string. The reading order is taken from the order the text is drawn in the source file, so may not be accurate.

Parameters

separator	The character(s) used to separate the text lines obtained from the document. If this is `null`, Environment.NewLine is used as a default separator.
includeAnnotations	If this is `true`, annotations (e.g. signatures) are included. Otherwise, only the page contents are included.

Returns

A string containing all the text in the document. Characters are converted from the UTF-8 representation used in the document to equivalent UTF-16 strings.

Definition at line 1241 of file MuPDFDocument.cs.

7.6.3.6 ExtractText() [2/2]

```
string MuPDFCore.MuPDFDocument.ExtractText (
            TesseractLanguage ocrLanguage,
            string separator = null,
            bool includeAnnotations = true )
```

Extracts all the text from the document and returns it as a string, using optical character recognition (OCR) to determine what text is written on the image.

Parameters

separator	The character(s) used to separate the text lines obtained from the document. If this is `null`, Environment.NewLine is used as a default separator.
ocrLanguage	The language to use for optical character recognition (OCR). If this is null, no OCR is performed.
includeAnnotations	If this is `true`, annotations (e.g. signatures) are included. Otherwise, only the page contents are included.

Returns

A string containing all the text in the document. Characters are converted from the UTF-8 representation used in the document to equivalent UTF-16 strings.

Definition at line 1288 of file MuPDFDocument.cs.

7.6.3.7 ExtractTextAsync()

```
async Task< string > MuPDFCore.MuPDFDocument.ExtractTextAsync (
            TesseractLanguage ocrLanguage,
            string separator = null,
            bool includeAnnotations = true,
            CancellationToken cancellationToken = default,
            IProgress< OCRProgressInfo > progress = null )
```

Extracts all the text from the document and returns it as a string, using optical character recognition (OCR) to determine what text is written on the image. The OCR step is run asynchronously, e.g. to avoid blocking the UI thread.

Parameters

separator	The character(s) used to separate the text lines obtained from the document. If this is `null`, Environment.NewLine is used as a default separator.
ocrLanguage	The language to use for optical character recognition (OCR). If this is null, no OCR is performed.
includeAnnotations	If this is `true`, annotations (e.g. signatures) are included. Otherwise, only the page contents are included.
cancellationToken	A CancellationToken used to cancel the operation.
progress	An IProgress<OCRProgressInfo> used to report progress.

Returns

A string containing all the text in the document. Characters are converted from the UTF-8 representation used in the document to equivalent UTF-16 strings.

Definition at line 1337 of file MuPDFDocument.cs.

7.6.3.8 GetMultiThreadedRenderer()

```
MuPDFMultiThreadedPageRenderer MuPDFCore.MuPDFDocument.GetMultiThreadedRenderer (
            int pageNumber,
            int threadCount,
            bool includeAnnotations = true )
```

Create a new MuPDFMultiThreadedPageRenderer that renders the specified page with the specified number of threads.

Parameters

pageNumber	The number of the page to render (starting at 0).
threadCount	The number of threads to use. This must be factorisable using only powers of 2, 3, 5 or 7. Otherwise, the biggest number smaller than *threadCount* that satisfies this condition is used.

Returns

A MuPDFMultiThreadedPageRenderer that can be used to render the specified page with the specified number of threads.

Parameters

includeAnnotations	If this is `true`, annotations (e.g. signatures) are included in the display list that is generated. Otherwise, only the page contents are included.

Definition at line 782 of file MuPDFDocument.cs.

7.6.3.9 GetRenderedSize() [1/2]

```
int MuPDFCore.MuPDFDocument.GetRenderedSize (
            int pageNumber,
            double zoom,
            PixelFormats pixelFormat )
```

Determine how many bytes will be necessary to render the specified page at the specified zoom level, using the the specified pixel format.

Parameters

pageNumber	The number of the page to render (starting at 0).
zoom	The scale at which the page will be rendered. This will determine the size in pixel of the image.
pixelFormat	The format of the pixels data.

Returns

An integer representing the number of bytes that will be necessary to store the pixel data of the rendered image.

Definition at line 804 of file MuPDFDocument.cs.

7.6.3.10 GetRenderedSize() [2/2]

```
static int MuPDFCore.MuPDFDocument.GetRenderedSize (
            Rectangle region,
            double zoom,
            PixelFormats pixelFormat )  [static]
```

Determine how many bytes will be necessary to render the specified region in page units at the specified zoom level, using the the specified pixel format.

Parameters

region	The region that will be rendered.
zoom	The scale at which the region will be rendered. This will determine the size in pixel of the image.
pixelFormat	The format of the pixels data.

Returns

An integer representing the number of bytes that will be necessary to store the pixel data of the rendered image.

Definition at line 821 of file MuPDFDocument.cs.

7.6.3.11 GetStructuredTextPage() [1/2]

```
MuPDFStructuredTextPage MuPDFCore.MuPDFDocument.GetStructuredTextPage (
            int pageNumber,
            bool includeAnnotations = true )
```

Creates a new MuPDFStructuredTextPage from the specified page. This contains information about the text layout that can be used for highlighting and searching. The reading order is taken from the order the text is drawn in the source file, so may not be accurate.

Parameters

pageNumber	The number of the page (starting at 0)
includeAnnotations	If this is `true`, annotations (e.g. signatures) are included. Otherwise, only the page contents are included.

Returns

A MuPDFStructuredTextPage containing a structured text representation of the page.

Definition at line 1154 of file MuPDFDocument.cs.

7.6.3.12 GetStructuredTextPage() [2/2]

```
MuPDFStructuredTextPage MuPDFCore.MuPDFDocument.GetStructuredTextPage (
            int pageNumber,
            TesseractLanguage ocrLanguage,
            bool includeAnnotations = true,
            CancellationToken cancellationToken = default,
            IProgress< OCRProgressInfo > progress = null )
```

Creates a new MuPDFStructuredTextPage from the specified page, using optical character recognition (OCR) to determine what text is written on the image. This contains information about the text layout that can be used for highlighting and searching.

Parameters

pageNumber	The number of the page (starting at 0)
ocrLanguage	The language to use for optical character recognition (OCR). If this is null, no OCR is performed.
includeAnnotations	If this is `true`, annotations (e.g. signatures) are included. Otherwise, only the page contents are included.
cancellationToken	A CancellationToken used to cancel the operation. Providing a value other than the default is not supported on Windows x86 and will throw a runtime exception.
progress	An IProgress<OCRProgressInfo> used to report progress. Providing a value other than null is not supported on Windows x86 and will throw a runtime exception.

Returns

A MuPDFStructuredTextPage containing a structured text representation of the page.

Definition at line 1178 of file MuPDFDocument.cs.

7.6.3.13 GetStructuredTextPageAsync()

```
async Task< MuPDFStructuredTextPage > MuPDFCore.MuPDFDocument.GetStructuredTextPageAsync (
            int pageNumber,
```

```
            TesseractLanguage ocrLanguage,
            bool includeAnnotations = true,
            CancellationToken cancellationToken = default,
            IProgress< OCRProgressInfo > progress = null )
```

Creates a new MuPDFStructuredTextPage from the specified page, using optical character recognition (OCR) to determine what text is written on the image. This contains information about the text layout that can be used for highlighting and searching. The OCR step is run asynchronously, e.g. to avoid blocking the UI thread.

Parameters

pageNumber	The number of the page (starting at 0)
ocrLanguage	The language to use for optical character recognition (OCR). If this is null, no OCR is performed.
includeAnnotations	If this is `true`, annotations (e.g. signatures) are included. Otherwise, only the page contents are included.
cancellationToken	A CancellationToken used to cancel the operation. Providing a value other than the default is not supported on Windows x86 and will throw a runtime exception.
progress	An IProgress<OCRProgressInfo> used to report progress. Providing a value other than null is not supported on Windows x86 and will throw a runtime exception.

Returns

A MuPDFStructuredTextPage containing a structured text representation of the page.

Definition at line 1211 of file MuPDFDocument.cs.

7.6.3.14 Render() [1/6]

```
byte[] MuPDFCore.MuPDFDocument.Render (
            int pageNumber,
            double zoom,
            PixelFormats pixelFormat,
            bool includeAnnotations = true )
```

Render a page to an array of bytes.

Parameters

pageNumber	The number of the page to render (starting at 0).
zoom	The scale at which the page will be rendered. This will determine the size in pixel of the image.
pixelFormat	The format of the pixel data.
includeAnnotations	If this is `true`, annotations (e.g. signatures) are included in the display list that is generated. Otherwise, only the page contents are included.

Returns

A byte array containing the raw values for the pixels of the rendered image.

Definition at line 636 of file MuPDFDocument.cs.

7.6.3.15 Render() [2/6]

```
void MuPDFCore.MuPDFDocument.Render (
            int pageNumber,
            double zoom,
            PixelFormats pixelFormat,
            IntPtr destination,
            bool includeAnnotations = true )
```

Render a page to the specified destination.

Parameters

pageNumber	The number of the page to render (starting at 0).
zoom	The scale at which the page will be rendered. This will determine the size in pixel of the image.
pixelFormat	The format of the pixel data.
destination	The address of the buffer where the pixel data will be written. There must be enough space available to write the values for all the pixels, otherwise this will fail catastrophically!
includeAnnotations	If this is `true`, annotations (e.g. signatures) are included in the display list that is generated. Otherwise, only the page contents are included.

Definition at line 715 of file MuPDFDocument.cs.

7.6.3.16 Render() [3/6]

```
Span< byte > MuPDFCore.MuPDFDocument.Render (
            int pageNumber,
            double zoom,
            PixelFormats pixelFormat,
            out IDisposable disposable,
            bool includeAnnotations = true )
```

Render a page to a Span<byte>.

Parameters

pageNumber	The number of the page to render (starting at 0).
zoom	The scale at which the page will be rendered. This will determine the size in pixel of the image.
pixelFormat	The format of the pixel data.
disposable	An IDisposable that can be used to free the memory where the image is stored. You should keep track of this and dispose it when you have finished working with the image.
includeAnnotations	If this is `true`, annotations (e.g. signatures) are included in the display list that is generated. Otherwise, only the page contents are included.

Definition at line 763 of file MuPDFDocument.cs.

7.6.3.17 Render() [4/6]

```
byte[] MuPDFCore.MuPDFDocument.Render (
            int pageNumber,
            Rectangle region,
            double zoom,
            PixelFormats pixelFormat,
            bool includeAnnotations = true )
```

Render (part of) a page to an array of bytes.

Parameters

pageNumber	The number of the page to render (starting at 0).
region	The region of the page to render in page units.
zoom	The scale at which the page will be rendered. This will determine the size in pixel of the image.
pixelFormat	The format of the pixel data.
includeAnnotations	If this is `true`, annotations (e.g. signatures) are included in the display list that is generated. Otherwise, only the page contents are included.

Returns

A byte array containing the raw values for the pixels of the rendered image.

Definition at line 602 of file MuPDFDocument.cs.

7.6.3.18 Render() [5/6]

```
void MuPDFCore.MuPDFDocument.Render (
            int pageNumber,
            Rectangle region,
            double zoom,
            PixelFormats pixelFormat,
            IntPtr destination,
            bool includeAnnotations = true )
```

Render (part of) a page to the specified destination.

Parameters

pageNumber	The number of the page to render (starting at 0).
region	The region of the page to render in page units.
zoom	The scale at which the page will be rendered. This will determine the size in pixel of the image.
pixelFormat	The format of the pixel data.
destination	The address of the buffer where the pixel data will be written. There must be enough space available to write the values for all the pixels, otherwise this will fail catastrophically!
includeAnnotations	If this is `true`, annotations (e.g. signatures) are included in the display list that is generated. Otherwise, only the page contents are included.

Definition at line 656 of file MuPDFDocument.cs.

7.6.3.19 Render() [6/6]

```
Span< byte > MuPDFCore.MuPDFDocument.Render (
            int pageNumber,
            Rectangle region,
            double zoom,
            PixelFormats pixelFormat,
            out IDisposable disposable,
            bool includeAnnotations = true )
```

Render (part of) a page to a Span<byte>.

Parameters

pageNumber	The number of the page to render (starting at 0).
region	The region of the page to render in page units.
zoom	The scale at which the page will be rendered. This will determine the size in pixel of the image.
pixelFormat	The format of the pixel data.
disposable	An IDisposable that can be used to free the memory where the image is stored. You should keep track of this and dispose it when you have finished working with the image.
includeAnnotations	If this is `true`, annotations (e.g. signatures) are included in the display list that is generated. Otherwise, only the page contents are included.

Definition at line 735 of file MuPDFDocument.cs.

7.6.3.20 SaveImage() [1/2]

```
void MuPDFCore.MuPDFDocument.SaveImage (
            int pageNumber,
            double zoom,
            PixelFormats pixelFormat,
            string fileName,
            RasterOutputFileTypes fileType,
            bool includeAnnotations = true )
```

Save a page to an image file in the specified format.

Parameters

pageNumber	The number of the page to render (starting at 0).
zoom	The scale at which the page will be rendered. This will determine the size in pixel of the image.
pixelFormat	The format of the pixel data.
fileName	The path to the output file.
fileType	The output format of the file.
includeAnnotations	If this is `true`, annotations (e.g. signatures) are included in the display list that is generated. Otherwise, only the page contents are included.

Definition at line 916 of file MuPDFDocument.cs.

7.6.3.21 SaveImage() [2/2]

```
void MuPDFCore.MuPDFDocument.SaveImage (
            int pageNumber,
            Rectangle region,
            double zoom,
            PixelFormats pixelFormat,
            string fileName,
            RasterOutputFileTypes fileType,
            bool includeAnnotations = true )
```

Save (part of) a page to an image file in the specified format.

Parameters

pageNumber	The number of the page to render (starting at 0).
region	The region of the page to render in page units.
zoom	The scale at which the page will be rendered. This will determine the size in pixel of the image.
pixelFormat	The format of the pixel data.
fileName	The path to the output file.
fileType	The output format of the file.
includeAnnotations	If this is `true`, annotations (e.g. signatures) are included in the display list that is generated. Otherwise, only the page contents are included.

Definition at line 857 of file MuPDFDocument.cs.

7.6.3.22 TryUnlock() [1/2]

```
bool MuPDFCore.MuPDFDocument.TryUnlock (
            string password )
```

Attempts to unlock the document with the supplied password.

Parameters

password	The user or owner password to use to unlock the document.

Returns

`true`If the document was successfully unlocked (or if it was never locked to begin with), `false` if the password was incorrect and the document is still locked.

This method can be used both to unlock an encrypted document and to check whether the supplied owner password is correct.

Definition at line 1383 of file MuPDFDocument.cs.

7.6.3.23 TryUnlock() [2/2]

```
bool MuPDFCore.MuPDFDocument.TryUnlock (
            string password,
            out PasswordTypes passwordType )
```

Attempts to unlock the document with the supplied password.

Parameters

password	The user or owner password to use to unlock the document.
passwordType	If the method returns true, this can be used to determine whether the supplied password was the user password or the owner password. If the method returns `false`, this can be used to determine whether a user password and/or an owner password are required.

Returns

`true`If the document was successfully unlocked (or if it was never locked to begin with), `false` if the password was incorrect and the document is still locked.

This method can be used both to unlock an encrypted document and to check whether the supplied owner password is correct.

Definition at line 1396 of file MuPDFDocument.cs.

7.6.3.24 WriteImage() [1/2]

```
void MuPDFCore.MuPDFDocument.WriteImage (
            int pageNumber,
            double zoom,
            PixelFormats pixelFormat,
            Stream outputStream,
            RasterOutputFileTypes fileType,
            bool includeAnnotations = true )
```

Write a page to an image stream in the specified format.

Parameters

pageNumber	The number of the page to render (starting at 0).
zoom	The scale at which the page will be rendered. This will determine the size in pixel of the image.
pixelFormat	The format of the pixel data.
outputStream	The stream to which the image data will be written.
fileType	The output format of the image.
includeAnnotations	If this is `true`, annotations (e.g. signatures) are included in the display list that is generated. Otherwise, only the page contents are included.

Definition at line 1008 of file MuPDFDocument.cs.

7.6.3.25 WriteImage() [2/2]

```
void MuPDFCore.MuPDFDocument.WriteImage (
            int pageNumber,
            Rectangle region,
            double zoom,
            PixelFormats pixelFormat,
            Stream outputStream,
            RasterOutputFileTypes fileType,
            bool includeAnnotations = true )
```

Write (part of) a page to an image stream in the specified format.

Parameters

pageNumber	The number of the page to render (starting at 0).
region	The region of the page to render in page units.
zoom	The scale at which the page will be rendered. This will determine the size in pixel of the image.
pixelFormat	The format of the pixel data.
outputStream	The stream to which the image data will be written.
fileType	The output format of the image.
includeAnnotations	If this is `true`, annotations (e.g. signatures) are included in the display list that is generated. Otherwise, only the page contents are included.

Definition at line 937 of file MuPDFDocument.cs.

7.6.4 Property Documentation

7.6.4.1 ClipToPageBounds

```
bool MuPDFCore.MuPDFDocument.ClipToPageBounds = true  [get], [set]
```

Defines whether the images resulting from rendering operations should be clipped to the page boundaries.

Definition at line 109 of file MuPDFDocument.cs.

7.6.4.2 EncryptionState

```
EncryptionState MuPDFCore.MuPDFDocument.EncryptionState  [get]
```

Describes the encryption state of the document.

Definition at line 114 of file MuPDFDocument.cs.

7.6.4.3 Pages

```
MuPDFPageCollection MuPDFCore.MuPDFDocument.Pages  [get]
```

The pages contained in the document.

Definition at line 104 of file MuPDFDocument.cs.

7.6.4.4 Restrictions

```
DocumentRestrictions MuPDFCore.MuPDFDocument.Restrictions  [get]
```

Describes the operations that are restricted on the document. This is not actually enforced by the library, but library users should only allow these operations if the document has been unlocked with the owner password (i.e. if RestrictionState is RestrictionState.Unlocked).

Definition at line 126 of file MuPDFDocument.cs.

7.6.4.5 RestrictionState

```
RestrictionState MuPDFCore.MuPDFDocument.RestrictionState  [get]
```

Describes the restriction state of the document.

Definition at line 119 of file MuPDFDocument.cs.

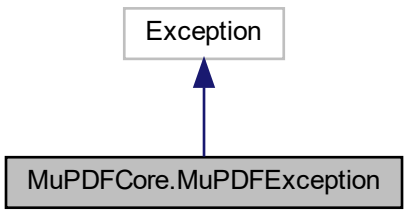
The documentation for this class was generated from the following file:

- MuPDFCore/MuPDFDocument.cs

7.7 MuPDFCore.MuPDFException Class Reference

The exception that is thrown when a MuPDF operation fails.

Inheritance diagram for MuPDFCore.MuPDFException:



Public Attributes

- readonly ExitCodes ErrorCode

  The ExitCodes returned by the native function.

7.7.1 Detailed Description

The exception that is thrown when a MuPDF operation fails.

Definition at line 478 of file MuPDF.cs.

7.7.2 Member Data Documentation

7.7.2.1 ErrorCode

```
readonly ExitCodes MuPDFCore.MuPDFException.ErrorCode
```

The ExitCodes returned by the native function.

Definition at line 483 of file MuPDF.cs.

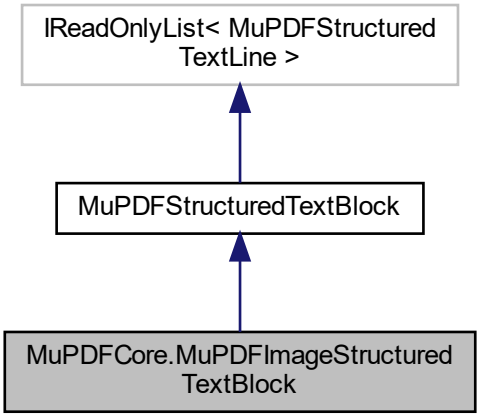
The documentation for this class was generated from the following file:

- MuPDFCore/MuPDF.cs

7.8 MuPDFCore.MuPDFImageStructuredTextBlock Class Reference

Represents a block containing a single image. The block contains a single line with a single character.

Inheritance diagram for MuPDFCore.MuPDFImageStructuredTextBlock:



Public Member Functions

- override IEnumerator< MuPDFStructuredTextLine > GetEnumerator ()

Properties

- override Types Type [get]
- override int Count [get]
- override MuPDFStructuredTextLine this[int index] [get]

Additional Inherited Members

7.8.1 Detailed Description

Represents a block containing a single image. The block contains a single line with a single character.

Definition at line 615 of file MuPDFStructuredTextPage.cs.

7.8.2 Member Function Documentation

7.8.2.1 GetEnumerator()

```
override IEnumerator< MuPDFStructuredTextLine > MuPDFCore.MuPDFImageStructuredTextBlock.Get↩
Enumerator ( ) [virtual]
```

Implements MuPDFCore.MuPDFStructuredTextBlock.

Definition at line 647 of file MuPDFStructuredTextPage.cs.

7.8.3 Property Documentation

7.8.3.1 Count

```
override int MuPDFCore.MuPDFImageStructuredTextBlock.Count [get]
```

Definition at line 621 of file MuPDFStructuredTextPage.cs.

7.8.3.2 this[int index]

```
override MuPDFStructuredTextLine MuPDFCore.MuPDFImageStructuredTextBlock.this[int index]  [get]
```

Definition at line 626 of file MuPDFStructuredTextPage.cs.

7.8.3.3 Type

```
override Types MuPDFCore.MuPDFImageStructuredTextBlock.Type  [get]
```

Definition at line 618 of file MuPDFStructuredTextPage.cs.

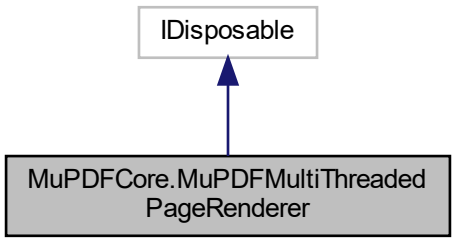
The documentation for this class was generated from the following file:

- MuPDFCore/MuPDFStructuredTextPage.cs

7.9 MuPDFCore.MuPDFMultiThreadedPageRenderer Class Reference

A class that holds the necessary resources to render a page of a MuPDF document using multiple threads.

Inheritance diagram for MuPDFCore.MuPDFMultiThreadedPageRenderer:



Public Member Functions

- void Render (RoundedSize targetSize, Rectangle region, IntPtr[ ] destinations, PixelFormats pixelFormat)

  Render the specified region to an image of the specified size, split in a number of tiles equal to the number of threads used by this MuPDFMultiThreadedPageRenderer, without marshaling. This method will not return until all the rendering threads have finished.
- delegate Span< byte > GetSpanItem (int index)

  Gets an element from a collection of Span<byte>
- GetSpanItem Render (RoundedSize targetSize, Rectangle region, out IDisposable[ ] disposables, PixelFormats pixelFormat)

  Render the specified region to an image of the specified size, split in a number of tiles equal to the number of threads used by this MuPDFMultiThreadedPageRenderer, without marshaling. This method will not return until all the rendering threads have finished. Since creating an array of Span<T> is not allowed, this method returns a delegate that accepts an integer parameter (representing the index of the span in the "array") and returns the Span<T> corresponding to that index.
- void Abort ()

  Signal to the rendering threads that they should abort rendering as soon as possible.
- RenderProgress GetProgress ()

  Get the current rendering progress of all the threads.
- void Dispose ()

Properties

- int ThreadCount [get]

  The number of threads that are used to render the image.

7.9.1 Detailed Description

A class that holds the necessary resources to render a page of a MuPDF document using multiple threads.

Definition at line 276 of file MuPDFMultiThreadedPageRenderer.cs.

7.9.2 Member Function Documentation

7.9.2.1 Abort()

```
void MuPDFCore.MuPDFMultiThreadedPageRenderer.Abort ( )
```

Signal to the rendering threads that they should abort rendering as soon as possible.

Definition at line 543 of file MuPDFMultiThreadedPageRenderer.cs.

7.9.2.2 Dispose()

```
void MuPDFCore.MuPDFMultiThreadedPageRenderer.Dispose ( )
```

Definition at line 592 of file MuPDFMultiThreadedPageRenderer.cs.

7.9.2.3 GetProgress()

```
RenderProgress MuPDFCore.MuPDFMultiThreadedPageRenderer.GetProgress ( )
```

Get the current rendering progress of all the threads.

Returns

A RenderProgress object containing the rendering progress of all the threads.

Definition at line 555 of file MuPDFMultiThreadedPageRenderer.cs.

7.9.2.4 GetSpanItem()

```
delegate Span< byte > MuPDFCore.MuPDFMultiThreadedPageRenderer.GetSpanItem (
            int index )
```

Gets an element from a collection of Span<byte>

Parameters

index	The index of the element to get.

Returns

An element from a collection of Span<byte>

7.9.2.5 Render() [1/2]

```
void MuPDFCore.MuPDFMultiThreadedPageRenderer.Render (
            RoundedSize targetSize,
            Rectangle region,
            IntPtr[] destinations,
            PixelFormats pixelFormat )
```

Render the specified region to an image of the specified size, split in a number of tiles equal to the number of threads used by this MuPDFMultiThreadedPageRenderer, without marshaling. This method will not return until all the rendering threads have finished.

Parameters

targetSize	The total size of the image that should be rendered.
region	The region in page units that should be rendered.
destinations	An array containing the addresses of the buffers where the rendered tiles will be written. There must be enough space available in each buffer to write the values for all the pixels of the tile, otherwise this will fail catastrophically! As long as the *targetSize* is the same, the size in pixel of the tiles is guaranteed to also be the same.
pixelFormat	The format of the pixel data.

Definition at line 383 of file MuPDFMultiThreadedPageRenderer.cs.

7.9.2.6 Render() [2/2]

```
GetSpanItem MuPDFCore.MuPDFMultiThreadedPageRenderer.Render (
            RoundedSize targetSize,
            Rectangle region,
            out IDisposable[] disposables,
            PixelFormats pixelFormat )
```

Render the specified region to an image of the specified size, split in a number of tiles equal to the number of threads used by this MuPDFMultiThreadedPageRenderer, without marshaling. This method will not return until all the rendering threads have finished. Since creating an array of Span<T> is not allowed, this method returns a delegate that accepts an integer parameter (representing the index of the span in the "array") and returns the Span<T> corresponding to that index.

Parameters

targetSize	The total size of the image that should be rendered.
region	The region in page units that should be rendered.
disposables	A collection of IDisposables that can be used to free the memory where the rendered tiles are stored. You should keep track of these and dispose them when you have finished working with the images.
pixelFormat	The format of the pixel data.

Returns

A delegate that accepts an integer parameter (representing the index of the span in the "array") and returns the Span<T> corresponding to that index.

Definition at line 509 of file MuPDFMultiThreadedPageRenderer.cs.

7.9.3 Property Documentation

7.9.3.1 ThreadCount

```
int MuPDFCore.MuPDFMultiThreadedPageRenderer.ThreadCount  [get]
```

The number of threads that are used to render the image.

Definition at line 306 of file MuPDFMultiThreadedPageRenderer.cs.

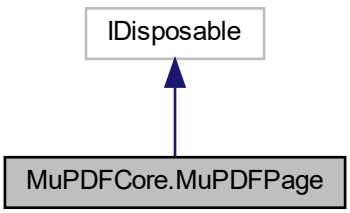
The documentation for this class was generated from the following file:

- MuPDFCore/MuPDFMultiThreadedPageRenderer.cs

7.10 MuPDFCore.MuPDFPage Class Reference

A wrapper over a MuPDF page object, which contains information about the page's boundaries.

Inheritance diagram for MuPDFCore.MuPDFPage:



Public Member Functions

- void Dispose ()

Properties

- Rectangle Bounds [get]

  The page's bounds at 72 DPI. Read-only.
- int PageNumber [get]

  The number of this page in the original document.

7.10.1 Detailed Description

A wrapper over a MuPDF page object, which contains information about the page's boundaries.

Definition at line 27 of file MuPDFPage.cs.

7.10.2 Member Function Documentation

7.10.2.1 Dispose()

```
void MuPDFCore.MuPDFPage.Dispose ( )
```

Definition at line 121 of file MuPDFPage.cs.

7.10.3 Property Documentation

7.10.3.1 Bounds

```
Rectangle MuPDFCore.MuPDFPage.Bounds [get]
```

The page's bounds at 72 DPI. Read-only.

Definition at line 32 of file MuPDFPage.cs.

7.10.3.2 PageNumber

```
int MuPDFCore.MuPDFPage.PageNumber  [get]
```

The number of this page in the original document.

Definition at line 37 of file MuPDFPage.cs.

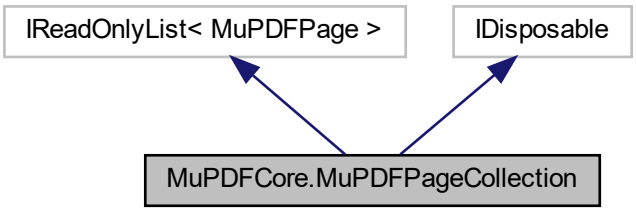
The documentation for this class was generated from the following file:

- MuPDFCore/MuPDFPage.cs

7.11 MuPDFCore.MuPDFPageCollection Class Reference

A lazy collection of MuPDFPages. Each page is loaded from the document as it is requested for the first time.

Inheritance diagram for MuPDFCore.MuPDFPageCollection:



Public Member Functions

- IEnumerator< MuPDFPage > GetEnumerator ()
  inheritdoc/>
- void Dispose ()

Properties

- int Length [get]
  The number of pages in the collection.
- int Count [get]
  The number of pages in the collection.
- MuPDFPage this[int index] [get]
  Get a page from the collection.

7.11.1 Detailed Description

A lazy collection of MuPDFPages. Each page is loaded from the document as it is requested for the first time.

Definition at line 131 of file MuPDFPage.cs.

7.11.2 Member Function Documentation

7.11.2.1 Dispose()

```
void MuPDFCore.MuPDFPageCollection.Dispose ( )
```

Definition at line 234 of file MuPDFPage.cs.

7.11.2.2 GetEnumerator()

```
IEnumerator< MuPDFPage > MuPDFCore.MuPDFPageCollection.GetEnumerator ( )
```

inheritdoc/>

Definition at line 195 of file MuPDFPage.cs.

7.11.3 Property Documentation

7.11.3.1 Count

```
int MuPDFCore.MuPDFPageCollection.Count  [get]
```

The number of pages in the collection.

Definition at line 156 of file MuPDFPage.cs.

7.11.3.2 Length

```
int MuPDFCore.MuPDFPageCollection.Length  [get]
```

The number of pages in the collection.

Definition at line 151 of file MuPDFPage.cs.

7.11.3.3 this[int index]

```
MuPDFPage MuPDFCore.MuPDFPageCollection.this[int index]  [get]
```

Get a page from the collection.

Parameters

index	The number of the page (starting at 0).

Returns

The specified MuPDFPage.

Definition at line 163 of file MuPDFPage.cs.

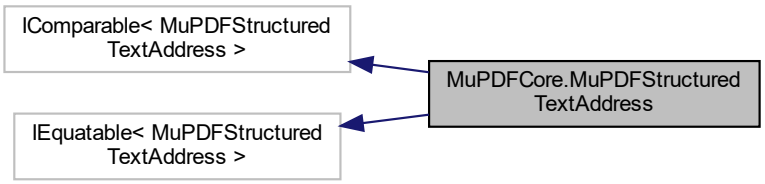
The documentation for this class was generated from the following file:

- MuPDFCore/MuPDFPage.cs

7.12 MuPDFCore.MuPDFStructuredTextAddress Struct Reference

Represents the address of a particular character in a MuPDFStructuredTextPage, in terms of block index, line index and character index.

Inheritance diagram for MuPDFCore.MuPDFStructuredTextAddress:



Public Member Functions

- MuPDFStructuredTextAddress (int blockIndex, int lineIndex, int characterIndex)

  Creates a new MuPDFStructuredTextAddress from the specified indices.
- int CompareTo (MuPDFStructuredTextAddress other)

  Compares this MuPDFStructuredTextAddress with another MuPDFStructuredTextAddress.
- override int GetHashCode ()
- MuPDFStructuredTextAddress? Increment (MuPDFStructuredTextPage page)

  Returns a MuPDFStructuredTextAddress corresponding to the next character in the specified page.
- bool Equals (MuPDFStructuredTextAddress other)

  Compares the current MuPDFStructuredTextAddress with another MuPDFStructuredTextAddress.
- override bool Equals (object other)

Static Public Member Functions

- static bool operator> (MuPDFStructuredTextAddress first, MuPDFStructuredTextAddress second)

  Compares two MuPDFStructuredTextAddress.
- static bool operator>= (MuPDFStructuredTextAddress first, MuPDFStructuredTextAddress second)

  Compares two MuPDFStructuredTextAddress.
- static bool operator< (MuPDFStructuredTextAddress first, MuPDFStructuredTextAddress second)

  Compares two MuPDFStructuredTextAddress.
- static bool operator<= (MuPDFStructuredTextAddress first, MuPDFStructuredTextAddress second)

  Compares two MuPDFStructuredTextAddress.
- static bool operator== (MuPDFStructuredTextAddress first, MuPDFStructuredTextAddress second)

  Compares two MuPDFStructuredTextAddress.
- static bool operator!= (MuPDFStructuredTextAddress first, MuPDFStructuredTextAddress second)

  Compares two MuPDFStructuredTextAddress.

Public Attributes

- readonly int BlockIndex

  The index of the block.
- readonly int LineIndex

  The index of the line within the block.
- readonly int CharacterIndex

  The index of the character within the line.

7.12.1 Detailed Description

Represents the address of a particular character in a MuPDFStructuredTextPage, in terms of block index, line index and character index.

Definition at line 961 of file MuPDFStructuredTextPage.cs.

7.12.2 Constructor & Destructor Documentation

7.12.2.1 MuPDFStructuredTextAddress()

```
MuPDFCore.MuPDFStructuredTextAddress.MuPDFStructuredTextAddress (
            int blockIndex,
            int lineIndex,
            int characterIndex )
```

Creates a new MuPDFStructuredTextAddress from the specified indices.

Parameters

blockIndex	The index of the block.
lineIndex	The index of the line within the block.
characterIndex	The index of the character within the line.

Definition at line 984 of file MuPDFStructuredTextPage.cs.

7.12.3 Member Function Documentation

7.12.3.1 CompareTo()

```
int MuPDFCore.MuPDFStructuredTextAddress.CompareTo (
            MuPDFStructuredTextAddress other )
```

Compares this MuPDFStructuredTextAddress with another MuPDFStructuredTextAddress.

Parameters

other	The MuPDFStructuredTextAddress to compare with the current instance.

Returns

-1 if the *other* MuPDFStructuredTextAddress comes after the current instance, 1 if it comes before, or 0 if they represent the same address.

Definition at line 996 of file MuPDFStructuredTextPage.cs.

7.12.3.2 Equals() [1/2]

```
bool MuPDFCore.MuPDFStructuredTextAddress.Equals (
            MuPDFStructuredTextAddress other )
```

Compares the current MuPDFStructuredTextAddress with another MuPDFStructuredTextAddress.

Parameters

other	The other MuPDFStructuredTextAddress to compare with the current instance.

Returns

`true` if the two MuPDFStructuredTextAddresses represent the same address; otherwise, `false`.

Definition at line 1239 of file MuPDFStructuredTextPage.cs.

7.12.3.3 Equals() [2/2]

```
override bool MuPDFCore.MuPDFStructuredTextAddress.Equals (
            object other )
```

Definition at line 1245 of file MuPDFStructuredTextPage.cs.

7.12.3.4 GetHashCode()

```
override int MuPDFCore.MuPDFStructuredTextAddress.GetHashCode ( )
```

Definition at line 1195 of file MuPDFStructuredTextPage.cs.

7.12.3.5 Increment()

```
MuPDFStructuredTextAddress?  MuPDFCore.MuPDFStructuredTextAddress.Increment (
            MuPDFStructuredTextPage page )
```

Returns a MuPDFStructuredTextAddress corresponding to the next character in the specified page.

Parameters

page	The page the address refers to.

Returns

A MuPDFStructuredTextAddress corresponding to the next character in the specified page.

Definition at line 1208 of file MuPDFStructuredTextPage.cs.

7.12.3.6 operator"!=()

```
static bool MuPDFCore.MuPDFStructuredTextAddress.operator!= (
            MuPDFStructuredTextAddress first,
            MuPDFStructuredTextAddress second )  [static]
```

Compares two MuPDFStructuredTextAddress.

Parameters

first	The first MuPDFStructuredTextAddress to compare.
second	The second MuPDFStructuredTextAddress to compare.

Returns

`true` if the two MuPDFStructuredTextAddresses represent different addresses; otherwise, `false`.

Definition at line 1189 of file MuPDFStructuredTextPage.cs.

7.12.3.7 operator<()

```
static bool MuPDFCore.MuPDFStructuredTextAddress.operator< (
            MuPDFStructuredTextAddress first,
            MuPDFStructuredTextAddress second )  [static]
```

Compares two MuPDFStructuredTextAddress.

Parameters

first	The first MuPDFStructuredTextAddress to compare.
second	The second MuPDFStructuredTextAddress to compare.

Returns

`true` if the *first* MuPDFStructuredTextAddress comes before the *second* one; otherwise, `false`.

Definition at line 1098 of file MuPDFStructuredTextPage.cs.

7.12.3.8 operator<=()

```
static bool MuPDFCore.MuPDFStructuredTextAddress.operator<= (
            MuPDFStructuredTextAddress first,
            MuPDFStructuredTextAddress second )  [static]
```

Compares two MuPDFStructuredTextAddress.

Parameters

first	The first MuPDFStructuredTextAddress to compare.
second	The second MuPDFStructuredTextAddress to compare.

Returns

`true` if the *first* MuPDFStructuredTextAddress comes before the *second* one or if they represent the same address; otherwise, `false`.

Definition at line 1138 of file MuPDFStructuredTextPage.cs.

7.12.3.9 operator==()

```
static bool MuPDFCore.MuPDFStructuredTextAddress.operator== (
            MuPDFStructuredTextAddress first,
            MuPDFStructuredTextAddress second )  [static]
```

Compares two MuPDFStructuredTextAddress.

Parameters

first	The first MuPDFStructuredTextAddress to compare.
second	The second MuPDFStructuredTextAddress to compare.

Returns

`true` if the two MuPDFStructuredTextAddresses represent the same address; otherwise, `false`.

Definition at line 1178 of file MuPDFStructuredTextPage.cs.

7.12.3.10 operator>()

```
static bool MuPDFCore.MuPDFStructuredTextAddress.operator> (
            MuPDFStructuredTextAddress first,
            MuPDFStructuredTextAddress second )  [static]
```

Compares two MuPDFStructuredTextAddress.

Parameters

first	The first MuPDFStructuredTextAddress to compare.
second	The second MuPDFStructuredTextAddress to compare.

Returns

`true` if the *first* MuPDFStructuredTextAddress comes after the *second* one; otherwise, `false`.

Definition at line 1018 of file MuPDFStructuredTextPage.cs.

7.12.3.11 operator>=()

```
static bool MuPDFCore.MuPDFStructuredTextAddress.operator>= (
            MuPDFStructuredTextAddress first,
            MuPDFStructuredTextAddress second )  [static]
```

Compares two MuPDFStructuredTextAddress.

Parameters

first	The first MuPDFStructuredTextAddress to compare.
second	The second MuPDFStructuredTextAddress to compare.

Returns

`true` if the *first* MuPDFStructuredTextAddress comes after the *second* one or if they represent the same address; otherwise, `false`.

Definition at line 1058 of file MuPDFStructuredTextPage.cs.

7.12.4 Member Data Documentation

7.12.4.1 BlockIndex

```
readonly int MuPDFCore.MuPDFStructuredTextAddress.BlockIndex
```

The index of the block.

Definition at line 966 of file MuPDFStructuredTextPage.cs.

7.12.4.2 CharacterIndex

```
readonly int MuPDFCore.MuPDFStructuredTextAddress.CharacterIndex
```

The index of the character within the line.

Definition at line 976 of file MuPDFStructuredTextPage.cs.

7.12.4.3 LineIndex

```
readonly int MuPDFCore.MuPDFStructuredTextAddress.LineIndex
```

The index of the line within the block.

Definition at line 971 of file MuPDFStructuredTextPage.cs.

The documentation for this struct was generated from the following file:

- MuPDFCore/MuPDFStructuredTextPage.cs

7.13 MuPDFCore.MuPDFStructuredTextAddressSpan Class Reference

Represents a range of characters in a MuPDFStructuredTextPage.

Public Member Functions

- MuPDFStructuredTextAddressSpan (MuPDFStructuredTextAddress start, MuPDFStructuredTextAddress? end)

  Creates a new MuPDFStructuredTextAddressSpan corresponding to the specified character range.

Public Attributes

- readonly MuPDFStructuredTextAddress Start

  The addres of the start of the range.
- readonly? MuPDFStructuredTextAddress End

  The address of the end of the range (inclusive), or `null` to signify an empty range.

7.13.1 Detailed Description

Represents a range of characters in a MuPDFStructuredTextPage.

Definition at line 1254 of file MuPDFStructuredTextPage.cs.

7.13.2 Constructor & Destructor Documentation

7.13.2.1 MuPDFStructuredTextAddressSpan()

```
MuPDFCore.MuPDFStructuredTextAddressSpan.MuPDFStructuredTextAddressSpan (
            MuPDFStructuredTextAddress start,
            MuPDFStructuredTextAddress?  end )
```

Creates a new MuPDFStructuredTextAddressSpan corresponding to the specified character range.

Parameters

start	The addres of the start of the range.
end	The address of the end of the range (inclusive), or `null` to signify an empty range.

Definition at line 1271 of file MuPDFStructuredTextPage.cs.

7.13.3 Member Data Documentation

7.13.3.1 End

```
readonly?  MuPDFStructuredTextAddress MuPDFCore.MuPDFStructuredTextAddressSpan.End
```

The address of the end of the range (inclusive), or `null` to signify an empty range.

Definition at line 1264 of file MuPDFStructuredTextPage.cs.

7.13.3.2 Start

```
readonly MuPDFStructuredTextAddress MuPDFCore.MuPDFStructuredTextAddressSpan.Start
```

The addres of the start of the range.

Definition at line 1259 of file MuPDFStructuredTextPage.cs.

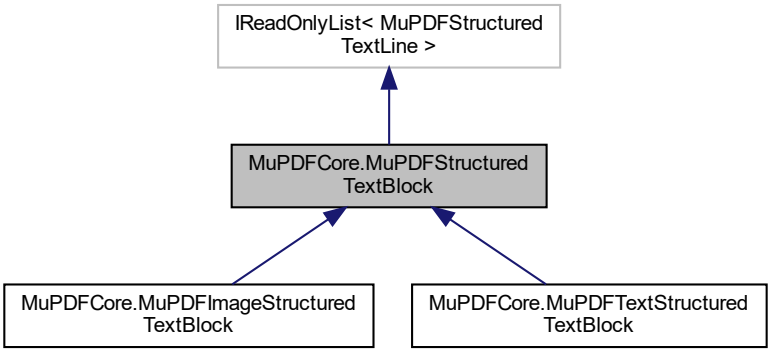
The documentation for this class was generated from the following file:

- MuPDFCore/MuPDFStructuredTextPage.cs

7.14 MuPDFCore.MuPDFStructuredTextBlock Class Reference

Represents a structured text block containing text or an image.

Inheritance diagram for MuPDFCore.MuPDFStructuredTextBlock:



Public Types

- enum Types { Text = 0 , Image = 1 }

  Defines the type of the block.

Public Member Functions

- abstract IEnumerator< MuPDFStructuredTextLine > GetEnumerator ()

Properties

- abstract Types Type [get]

  The type of the block.
- Rectangle BoundingBox [get]

  The bounding box of the block.
- abstract int Count [get]

  The number of lines in the block.
- abstract MuPDFStructuredTextLine this[int index] [get]

  Gets the specified line from the block.

7.14.1 Detailed Description

Represents a structured text block containing text or an image.

Definition at line 556 of file MuPDFStructuredTextPage.cs.

7.14.2 Member Enumeration Documentation

7.14.2.1 Types

```
enum MuPDFCore.MuPDFStructuredTextBlock.Types
```

Defines the type of the block.

Enumerator

Text	The block contains text.
Image	The block contains an image.

Definition at line 561 of file MuPDFStructuredTextPage.cs.

7.14.3 Member Function Documentation

7.14.3.1 GetEnumerator()

```
abstract IEnumerator< MuPDFStructuredTextLine > MuPDFCore.MuPDFStructuredTextBlock.GetEnumerator
( )  [pure virtual]
```

Implemented in MuPDFCore.MuPDFImageStructuredTextBlock, and MuPDFCore.MuPDFTextStructuredTextBlock.

7.14.4 Property Documentation

7.14.4.1 BoundingBox

```
Rectangle MuPDFCore.MuPDFStructuredTextBlock.BoundingBox  [get]
```

The bounding box of the block.

Definition at line 582 of file MuPDFStructuredTextPage.cs.

7.14.4.2 Count

```
abstract int MuPDFCore.MuPDFStructuredTextBlock.Count  [get]
```

The number of lines in the block.

Definition at line 587 of file MuPDFStructuredTextPage.cs.

7.14.4.3 this[int index]

```
abstract MuPDFStructuredTextLine MuPDFCore.MuPDFStructuredTextBlock.this[int index]  [get]
```

Gets the specified line from the block.

Parameters

index	The index of the line to extract.

Returns

The MuPDFStructuredTextLine with the specified *index* .

Definition at line 594 of file MuPDFStructuredTextPage.cs.

7.14.4.4 Type

```
abstract Types MuPDFCore.MuPDFStructuredTextBlock.Type  [get]
```

The type of the block.

Definition at line 577 of file MuPDFStructuredTextPage.cs.

The documentation for this class was generated from the following file:

- MuPDFCore/MuPDFStructuredTextPage.cs

7.15 MuPDFCore.MuPDFStructuredTextCharacter Class Reference

Represents a single text character.

Public Member Functions

- override string ToString ()

  Returns a string representation of the character.

Properties

- int CodePoint `[get]`

  The unicode code point of the character.
- string Character `[get]`

  A string representation of the character. It may consist of a single char or of a surrogate pair of chars.
- int Color `[get]`

  An sRGB hex representation of the colour of the character.
- PointF Origin `[get]`

  The baseline origin of the character.
- Quad BoundingQuad `[get]`

  A quadrilater bound for the character. This may or may not be a rectangle.
- float Size `[get]`

  The size in points of the character.

7.15.1 Detailed Description

Represents a single text character.

Definition at line 906 of file MuPDFStructuredTextPage.cs.

7.15.2 Member Function Documentation

7.15.2.1 ToString()

```
override string MuPDFCore.MuPDFStructuredTextCharacter.ToString ( )
```

Returns a string representation of the character.

Returns

A string representation of the character.

Definition at line 952 of file MuPDFStructuredTextPage.cs.

7.15.3 Property Documentation

7.15.3.1 BoundingQuad

```
Quad MuPDFCore.MuPDFStructuredTextCharacter.BoundingQuad [get]
```

A quadrilater bound for the character. This may or may not be a rectangle.

Definition at line 931 of file MuPDFStructuredTextPage.cs.

7.15.3.2 Character

```
string MuPDFCore.MuPDFStructuredTextCharacter.Character [get]
```

A string representation of the character. It may consist of a single char or of a surrogate pair of chars.

Definition at line 916 of file MuPDFStructuredTextPage.cs.

7.15.3.3 CodePoint

```
int MuPDFCore.MuPDFStructuredTextCharacter.CodePoint [get]
```

The unicode code point of the character.

Definition at line 911 of file MuPDFStructuredTextPage.cs.

7.15.3.4 Color

```
int MuPDFCore.MuPDFStructuredTextCharacter.Color [get]
```

An sRGB hex representation of the colour of the character.

Definition at line 921 of file MuPDFStructuredTextPage.cs.

7.15.3.5 Origin

```
PointF MuPDFCore.MuPDFStructuredTextCharacter.Origin [get]
```

The baseline origin of the character.

Definition at line 926 of file MuPDFStructuredTextPage.cs.

7.15.3.6 Size

```
float MuPDFCore.MuPDFStructuredTextCharacter.Size  [get]
```

The size in points of the character.

Definition at line 936 of file MuPDFStructuredTextPage.cs.

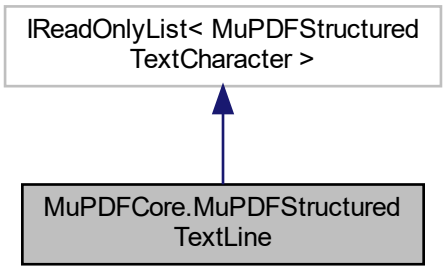
The documentation for this class was generated from the following file:

- MuPDFCore/MuPDFStructuredTextPage.cs

7.16 MuPDFCore.MuPDFStructuredTextLine Class Reference

Represents a single line of text (i.e. characters that share a common baseline).

Inheritance diagram for MuPDFCore.MuPDFStructuredTextLine:



Public Types

- enum WritingModes { Horizontal = 0 , Vertical = 1 }

  Defines the writing mode of the text.

Public Member Functions

- override string ToString ()

  Returns a string representation of the line.
- IEnumerator< MuPDFStructuredTextCharacter > GetEnumerator ()

Properties

- WritingModes WritingMode [get]

  The writing mode of the text.
- PointF Direction [get]

  The normalised direction of the text baseline.
- Rectangle BoundingBox [get]

  The bounding box of the line.
- MuPDFStructuredTextCharacter[] Characters [get]

  The characters contained in the line.
- string Text [get]

  A string representation of the characters contained in the line.
- int Count [get]

  The number of characters in the line.
- MuPDFStructuredTextCharacter this[int index] [get]

  Gets the specified character from the line.

7.16.1 Detailed Description

Represents a single line of text (i.e. characters that share a common baseline).

Definition at line 752 of file MuPDFStructuredTextPage.cs.

7.16.2 Member Enumeration Documentation

7.16.2.1 WritingModes

`enum MuPDFCore.MuPDFStructuredTextLine.WritingModes`

Defines the writing mode of the text.

Enumerator

Horizontal	The text is written horizontally.
Vertical	The text is written vertically.

Definition at line 757 of file MuPDFStructuredTextPage.cs.

7.16.3 Member Function Documentation

7.16.3.1 GetEnumerator()

```
IEnumerator< MuPDFStructuredTextCharacter > MuPDFCore.MuPDFStructuredTextLine.GetEnumerator (
)
```

Definition at line 892 of file MuPDFStructuredTextPage.cs.

7.16.3.2 ToString()

```
override string MuPDFCore.MuPDFStructuredTextLine.ToString ( )
```

Returns a string representation of the line.

Returns

A string representation of the line.

Definition at line 886 of file MuPDFStructuredTextPage.cs.

7.16.4 Property Documentation

7.16.4.1 BoundingBox

```
Rectangle MuPDFCore.MuPDFStructuredTextLine.BoundingBox [get]
```

The bounding box of the line.

Definition at line 783 of file MuPDFStructuredTextPage.cs.

7.16.4.2 Characters

```
MuPDFStructuredTextCharacter [] MuPDFCore.MuPDFStructuredTextLine.Characters [get]
```

The characters contained in the line.

Definition at line 788 of file MuPDFStructuredTextPage.cs.

7.16.4.3 Count

```
int MuPDFCore.MuPDFStructuredTextLine.Count  [get]
```

The number of characters in the line.

Definition at line 798 of file MuPDFStructuredTextPage.cs.

7.16.4.4 Direction

```
PointF MuPDFCore.MuPDFStructuredTextLine.Direction  [get]
```

The normalised direction of the text baseline.

Definition at line 778 of file MuPDFStructuredTextPage.cs.

7.16.4.5 Text

```
string MuPDFCore.MuPDFStructuredTextLine.Text  [get]
```

A string representation of the characters contained in the line.

Definition at line 793 of file MuPDFStructuredTextPage.cs.

7.16.4.6 this[int index]

```
MuPDFStructuredTextCharacter MuPDFCore.MuPDFStructuredTextLine.this[int index]  [get]
```

Gets the specified character from the line.

Parameters

index	The index of the character.

Returns

The MuPDFStructuredTextCharacter with the specified *index* .

Definition at line 805 of file MuPDFStructuredTextPage.cs.

7.16.4.7 WritingMode

```
WritingModes MuPDFCore.MuPDFStructuredTextLine.WritingMode  [get]
```

The writing mode of the text.

Definition at line 773 of file MuPDFStructuredTextPage.cs.

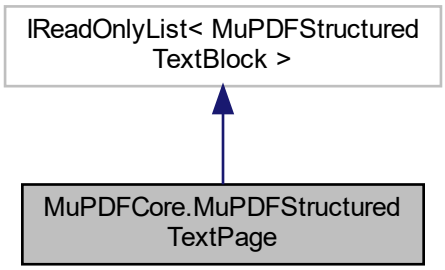
The documentation for this class was generated from the following file:

- MuPDFCore/MuPDFStructuredTextPage.cs

7.17 MuPDFCore.MuPDFStructuredTextPage Class Reference

Represents a structured representation of the text contained in a page.

Inheritance diagram for MuPDFCore.MuPDFStructuredTextPage:



Public Member Functions

- MuPDFStructuredTextAddress? GetHitAddress (PointF point, bool includeImages)

  Gets the address of the character that contains the specified point in page units.
- MuPDFStructuredTextAddress? GetClosestHitAddress (PointF point, bool includeImages)

  Gets the address of the character that contains the specified point in page units.
- IEnumerable< Quad > GetHighlightQuads (MuPDFStructuredTextAddressSpan range, bool includeImages)

  Gets a collection of Quads delimiting the specified character range . Where possible, these are collapsed at the line and block level. Each Quad may or may not be a rectangle.
- string GetText (MuPDFStructuredTextAddressSpan range)

  Gets the text corresponding to the specified character range . Blocks containing images are ignored.
- IEnumerable< MuPDFStructuredTextAddressSpan > Search (Regex needle)

  Searches for the specified Regex in the text of the page. A single match cannot span multiple lines.
- IEnumerator< MuPDFStructuredTextBlock > GetEnumerator ()

Properties

- MuPDFStructuredTextBlock[ ] StructuredTextBlocks [get]

  The blocks contained in the page.
- int Count [get]

  The number of blocks in the page.
- MuPDFStructuredTextBlock this[int index] [get]

  Gets the specified block in the page.
- MuPDFStructuredTextCharacter this[MuPDFStructuredTextAddress address] [get]

  Gets the specified character in the page.

7.17.1 Detailed Description

Represents a structured representation of the text contained in a page.

Definition at line 31 of file MuPDFStructuredTextPage.cs.

7.17.2 Member Function Documentation

7.17.2.1 GetClosestHitAddress()

```
MuPDFStructuredTextAddress?  MuPDFCore.MuPDFStructuredTextPage.GetClosestHitAddress (
            PointF point,
            bool includeImages )
```

Gets the address of the character that contains the specified *point* in page units.

Parameters

point	The point that must be closest to the character. This is expressed in page units (i.e. with a zoom factor of 1).
includeImages	If this is `true`, blocks containing images may be returned. Otherwise, only blocks containing text are considered.

Returns

The address of the character closest to the specified *point* This is `null` only if the page contains no characters.

Definition at line 208 of file MuPDFStructuredTextPage.cs.

7.17.2.2 GetEnumerator()

```
IEnumerator< MuPDFStructuredTextBlock > MuPDFCore.MuPDFStructuredTextPage.GetEnumerator ( )
```

Definition at line 542 of file MuPDFStructuredTextPage.cs.

7.17.2.3 GetHighlightQuads()

```
IEnumerable< Quad > MuPDFCore.MuPDFStructuredTextPage.GetHighlightQuads (
            MuPDFStructuredTextAddressSpan range,
            bool includeImages )
```

Gets a collection of Quads delimiting the specified character *range* . Where possible, these are collapsed at the line and block level. Each Quad may or may not be a rectangle.

Parameters

range	A MuPDFStructuredTextAddressSpan representing the character range
includeImages	If this is `true`, the bounding boxes for blocks containing images are also returned. Otherwise, only blocks containing text are considered.

Returns

A lazy collection of Quads delimiting the characters in the specified *includeImages* .

Definition at line 281 of file MuPDFStructuredTextPage.cs.

7.17.2.4 GetHitAddress()

```
MuPDFStructuredTextAddress?  MuPDFCore.MuPDFStructuredTextPage.GetHitAddress (
            PointF point,
            bool includeImages )
```

Gets the address of the character that contains the specified *point* in page units.

Parameters

point	The point that must be contained by the character. This is expressed in page units (i.e. with a zoom factor of 1).
includeImages	If this is `true`, blocks containing images may be returned. Otherwise, only blocks containing text are considered.

Returns

The address of the character containing the specified *point* , or `null` if no character contains the *point* .

Definition at line 174 of file MuPDFStructuredTextPage.cs.

7.17.2.5 GetText()

```
string MuPDFCore.MuPDFStructuredTextPage.GetText (
            MuPDFStructuredTextAddressSpan range )
```

Gets the text corresponding to the specified character *range* . Blocks containing images are ignored.

Parameters

range	A MuPDFStructuredTextAddressSpan representing the range of text to extract.

Returns

A string representation of the text contained in the specified *range* .

Definition at line 386 of file MuPDFStructuredTextPage.cs.

7.17.2.6 Search()

```
IEnumerable< MuPDFStructuredTextAddressSpan > MuPDFCore.MuPDFStructuredTextPage.Search (
            Regex needle )
```

Searches for the specified Regex in the text of the page. A single match cannot span multiple lines.

Parameters

needle	The Regex to search for.

Returns

A lazy collection of MuPDFStructuredTextAddressSpans representing all the occurrences of the *needle* in the text.

Definition at line 497 of file MuPDFStructuredTextPage.cs.

7.17.3 Property Documentation

7.17.3.1 Count

```
int MuPDFCore.MuPDFStructuredTextPage.Count  [get]
```

The number of blocks in the page.

Definition at line 41 of file MuPDFStructuredTextPage.cs.

7.17.3.2 StructuredTextBlocks

```
MuPDFStructuredTextBlock [] MuPDFCore.MuPDFStructuredTextPage.StructuredTextBlocks  [get]
```

The blocks contained in the page.

Definition at line 36 of file MuPDFStructuredTextPage.cs.

7.17.3.3 this[int index]

```
MuPDFStructuredTextBlock MuPDFCore.MuPDFStructuredTextPage.this[int index]  [get]
```

Gets the specified block in the page.

Parameters

index	The index of the block.

Returns

The block with the specified *index* .

Definition at line 48 of file MuPDFStructuredTextPage.cs.

7.17.3.4 this[MuPDFStructuredTextAddress address]

```
MuPDFStructuredTextCharacter MuPDFCore.MuPDFStructuredTextPage.this[MuPDFStructuredTextAddress
address]  [get]
```

Gets the specified character in the page.

Parameters

address	The address (block, line and character index) of the character.

Returns

A MuPDFStructuredTextCharacter representing the specified character.

Definition at line 55 of file MuPDFStructuredTextPage.cs.

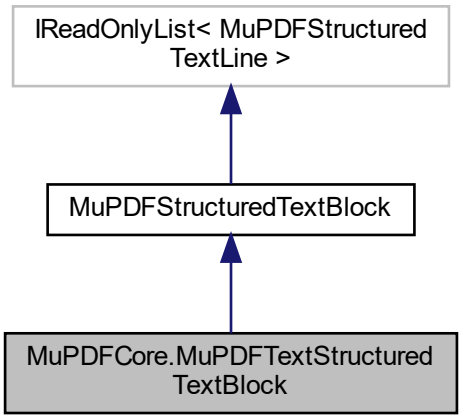
The documentation for this class was generated from the following file:

- MuPDFCore/MuPDFStructuredTextPage.cs

7.18 MuPDFCore.MuPDFTextStructuredTextBlock Class Reference

Represents a block containing multiple lines of text (typically a paragraph).

Inheritance diagram for MuPDFCore.MuPDFTextStructuredTextBlock:



Public Member Functions

- override IEnumerator< MuPDFStructuredTextLine > GetEnumerator ()
- override string ToString ()

  Returns the text contained in the block as a string.

Properties

- override Types Type `[get]`
- MuPDFStructuredTextLine[ ] Lines `[get]`

  The lines of text in the block.
- override int Count `[get]`
- override MuPDFStructuredTextLine this[int index] `[get]`

Additional Inherited Members

7.18.1 Detailed Description

Represents a block containing multiple lines of text (typically a paragraph).

Definition at line 656 of file MuPDFStructuredTextPage.cs.

7.18.2 Member Function Documentation

7.18.2.1 GetEnumerator()

```
override IEnumerator< MuPDFStructuredTextLine > MuPDFCore.MuPDFTextStructuredTextBlock.Get↩
Enumerator ( )  [virtual]
```

Implements MuPDFCore.MuPDFStructuredTextBlock.

Definition at line 727 of file MuPDFStructuredTextPage.cs.

7.18.2.2 ToString()

```
override string MuPDFCore.MuPDFTextStructuredTextBlock.ToString ( )
```

Returns the text contained in the block as a string.

Returns

The text contained in the block as a string. If the block contains at least one line, the return value has a line terminator at the end.

Definition at line 736 of file MuPDFStructuredTextPage.cs.

7.18.3 Property Documentation

7.18.3.1 Count

```
override int MuPDFCore.MuPDFTextStructuredTextBlock.Count  [get]
```

Definition at line 667 of file MuPDFStructuredTextPage.cs.

7.18.3.2 Lines

```
MuPDFStructuredTextLine [] MuPDFCore.MuPDFTextStructuredTextBlock.Lines  [get]
```

The lines of text in the block.

Definition at line 664 of file MuPDFStructuredTextPage.cs.

7.18.3.3 this[int index]

```
override MuPDFStructuredTextLine MuPDFCore.MuPDFTextStructuredTextBlock.this[int index]  [get]
```

Definition at line 670 of file MuPDFStructuredTextPage.cs.

7.18.3.4 Type

```
override Types MuPDFCore.MuPDFTextStructuredTextBlock.Type  [get]
```

Definition at line 659 of file MuPDFStructuredTextPage.cs.

The documentation for this class was generated from the following file:

- MuPDFCore/MuPDFStructuredTextPage.cs

7.19 MuPDFCore.OCRProgressInfo Class Reference

Describes OCR progress.

Properties

- double Progress [get]
  A value between 0 and 1, indicating how much progress has been completed.

7.19.1 Detailed Description

Describes OCR progress.

Definition at line 15 of file MuPDFStructuredTextPage.cs.

7.19.2 Property Documentation

7.19.2.1 Progress

```
double MuPDFCore.OCRProgressInfo.Progress  [get]
```

A value between 0 and 1, indicating how much progress has been completed.

Definition at line 20 of file MuPDFStructuredTextPage.cs.

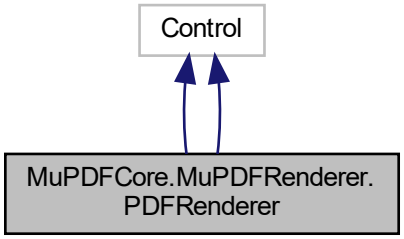
The documentation for this class was generated from the following file:

- MuPDFCore/MuPDFStructuredTextPage.cs

7.20 MuPDFCore.MuPDFRenderer.PDFRenderer Class Reference

A control to render PDF documents (and other formats), potentally using multiple threads.

Inheritance diagram for MuPDFCore.MuPDFRenderer.PDFRenderer:



Public Types

- enum PointerEventHandlers { Pan , Highlight , PanHighlight , Custom }

  Identifies the action to perform on pointer events.

Public Member Functions

- PDFRenderer ()

  Initializes a new instance of the PDFRenderer class.
- void Initialize (MuPDFDocument document, int threadCount=0, int pageNumber=0, double resolution↩ Multiplier=1, bool includeAnnotations=true, TesseractLanguage ocrLanguage=null)

  Set up the PDFRenderer to display a page of a MuPDFDocument.
- async Task InitializeAsync (MuPDFDocument document, int threadCount=0, int pageNumber=0, double resolutionMultiplier=1, bool includeAnnotations=true, TesseractLanguage ocrLanguage=null, Cancellation↩ Token ocrCancellationToken=default, IProgress< OCRProgressInfo > ocrProgress=null)

  Set up the PDFRenderer to display a page of a MuPDFDocument. The OCR step is run asynchronously, in order not to block the UI thread.
- void Initialize (string fileName, int threadCount=0, int pageNumber=0, double resolutionMultiplier=1, bool includeAnnotations=true, TesseractLanguage ocrLanguage=null)

  Set up the PDFRenderer to display a page of a document that will be loaded from disk.
- async Task InitializeAsync (string fileName, int threadCount=0, int pageNumber=0, double resolution↩ Multiplier=1, bool includeAnnotations=true, TesseractLanguage ocrLanguage=null, CancellationToken ocr↩ CancellationToken=default, IProgress< OCRProgressInfo > ocrProgress=null)

  Set up the PDFRenderer to display a page of a document that will be loaded from disk. The OCR step is run asynchronously, in order not to block the UI thread.
- void Initialize (MemoryStream ms, InputFileTypes fileType, int threadCount=0, int pageNumber=0, double resolutionMultiplier=1, bool includeAnnotations=true, TesseractLanguage ocrLanguage=null)

  Set up the PDFRenderer to display a page of a document that will be loaded from a MemoryStream.
- async Task InitializeAsync (MemoryStream ms, InputFileTypes fileType, int threadCount=0, int page↩ Number=0, double resolutionMultiplier=1, bool includeAnnotations=true, TesseractLanguage ocr↩ Language=null, CancellationToken ocrCancellationToken=default, IProgress< OCRProgressInfo > ocr↩ Progress=null)

Set up the PDFRenderer to display a page of a document that will be loaded from a MemoryStream. The OCR step is run asynchronously, in order not to block the UI thread.

- void Initialize (byte[] dataBytes, InputFileTypes fileType, int offset=0, int length=-1, int threadCount=0, int pageNumber=0, double resolutionMultiplier=1, bool includeAnnotations=true, TesseractLanguage ocr↩ Language=null)

  Set up the PDFRenderer to display a page of a document that will be loaded from an array of bytes.
- async Task InitializeAsync (byte[] dataBytes, InputFileTypes fileType, int offset=0, int length=-1, int threadCount=0, int pageNumber=0, double resolutionMultiplier=1, bool includeAnnotations=true, TesseractLanguage ocrLanguage=null, CancellationToken ocrCancellationToken=default, IProgress< OCRProgressInfo > ocrProgress=null)

  Set up the PDFRenderer to display a page of a document that will be loaded from an array of bytes. The OCR step is run asynchronously, in order not to block the UI thread.
- void ReleaseResources ()

  Release resources held by this PDFRenderer. This is not an irreversible step: using one of the Initialize overloads after calling this method will restore functionality.
- void SetDisplayAreaNow (Rect value)

  Set the current display area to the specified value , skipping all transitions.
- void ZoomStep (double count, Point? center=null)

  Zoom around a point.
- void Contain ()

  Alter the display area so that the whole page fits on screen.
- void Cover ()

  Alter the display area so that the page covers the whole surface of the PDFRenderer (even though parts of the page may be outside it).
- RenderProgress GetProgress ()

  Get the current rendering progress.
- string GetSelectedText ()

  Get the currently selected text.
- void SelectAll ()

  Selects all the text in the document.
- int Search (Regex needle)

  Highlights all matches of the specified Regex in the text and returns the number of matches found. Matches cannot span multiple lines.
- override void Render (DrawingContext context)

  Draw the rendered document.

Static Public Attributes

- static readonly DirectProperty< PDFRenderer, int > RenderThreadCountProperty = AvaloniaProperty.↩ RegisterDirect<PDFRenderer, int>(nameof(RenderThreadCount), o => o.RenderThreadCount)

  Defines the RenderThreadCount property.
- static readonly DirectProperty< PDFRenderer, int > PageNumberProperty = AvaloniaProperty.Register↩ Direct<PDFRenderer, int>(nameof(PageNumber), o => o.PageNumber)

  Defines the PageNumber property.
- static readonly DirectProperty< PDFRenderer, bool > IsViewerInitializedProperty = AvaloniaProperty.↩ RegisterDirect<PDFRenderer, bool>(nameof(IsViewerInitialized), o => o.IsViewerInitialized)

  Defines the IsViewerInitialized property.
- static readonly DirectProperty< PDFRenderer, Rect > PageSizeProperty = AvaloniaProperty.Register↩ Direct<PDFRenderer, Rect>(nameof(PageSize), o => o.PageSize)

  Defines the PageSize property.
- static readonly StyledProperty< Rect > DisplayAreaProperty = AvaloniaProperty.Register<PDFRenderer, Rect>(nameof(DisplayArea))

Defines the DisplayArea property.

- static readonly StyledProperty< double > ZoomIncrementProperty = AvaloniaProperty.Register<PDFRenderer, double>(nameof(ZoomIncrement), Math.Pow(2, 1.0 / 3.0), defaultBindingMode: Avalonia.Data.Binding↩ Mode.TwoWay)

  Defines the ZoomIncrement property.
- static readonly StyledProperty< IBrush > BackgroundProperty = AvaloniaProperty.Register<PDFRenderer, IBrush>(nameof(Background))

  Defines the Background property.
- static readonly StyledProperty< IBrush > PageBackgroundProperty = AvaloniaProperty.Register<PDFRenderer, IBrush>(nameof(PageBackground))

  Defines the PageBackground property.
- static readonly DirectProperty< PDFRenderer, double > ZoomProperty = AvaloniaProperty.Register↩ Direct<PDFRenderer, double>(nameof(Zoom), o => o.Zoom, (o, v) => o.Zoom = v, defaultBindingMode: Avalonia.Data.BindingMode.TwoWay)

  Defines the Zoom property.
- static readonly StyledProperty< PointerEventHandlers > PointerEventHandlerTypeProperty = Avalonia↩ Property.Register<PDFRenderer, PointerEventHandlers>(nameof(PointerEventHandlersType), PointerEventHandlers.PanHigh

  Defines the PointerEventHandlersType property.
- static readonly StyledProperty< bool > ZoomEnabledProperty = AvaloniaProperty.Register<PDFRenderer, bool>(nameof(ZoomEnabled), true)

  Defines the ZoomEnabled property.
- static readonly StyledProperty< MuPDFStructuredTextAddressSpan > SelectionProperty = Avalonia↩ Property.Register<PDFRenderer, MuPDFStructuredTextAddressSpan>(nameof(Selection), null)

  Defines the Selection property.
- static readonly StyledProperty< IBrush > SelectionBrushProperty = AvaloniaProperty.Register<PDFRenderer, IBrush>(nameof(SelectionBrush), new SolidColorBrush(Color.FromArgb(96, 86, 180, 233)))

  Defines the SelectionBrush property.
- static readonly StyledProperty< IEnumerable< MuPDFStructuredTextAddressSpan > > HighlightedRegionsProperty = AvaloniaProperty.Register<PDFRenderer, IEnumerable<MuPDFStructuredTextAddressSpan>>(nameof(HighlightedRegion null)

  Defines the HighlightedRegions property.
- static readonly StyledProperty< IBrush > HighlightBrushProperty = AvaloniaProperty.Register<PDFRenderer, IBrush>(nameof(HighlightBrush), new SolidColorBrush(Color.FromArgb(96, 230, 159, 0)))

  Defines the HighlightBrush property.

Properties

- int RenderThreadCount `[get]`

  Exposes the number of threads that the current instance is using to render the document. Read-only.
- int PageNumber `[get]`

  Exposes the number of the page that the current instance is rendering. Read-only.
- bool IsViewerInitialized `[get]`

  Whether the current instance has been initialised with a document to render or not. Read-only.
- Rect PageSize `[get]`

  Exposes the size of the page that is drawn by the current instance (in page units).
- Rect DisplayArea `[get, set]`

  The region of the page (in page units) that is currently displayed by the current instance. This always has the same aspect ratio of the bounds of this control. When this is set, the value is sanitised so that the smallest rectangle with the correct aspect ratio containing the requested value is chosen.
- double ZoomIncrement `[get, set]`

  Determines by how much the scale will be increased/decreased by the ZoomStep(double, Point?) method. Set this to a value smaller than 1 to invert the zoom in/out direction.

- IBrush Background [get, set]

  The background colour of the control.
- IBrush PageBackground [get, set]

  The background colour to use for the page drawn by the control.
- double Zoom [get, set]

  The current zoom level. Setting this will change the DisplayArea appropriately, zooming around the center of the DisplayArea.
- PointerEventHandlers PointerEventHandlersType [get, set]

  Whether the default handlers for pointer events (which are used for panning around the page) should be enabled. If this is false, you will have to implement your own way to pan around the document by changing the DisplayArea.
- bool ZoomEnabled [get, set]

  Whether the default handlers for pointer wheel events (which are used for zooming in/out) should be enabled. If this is false, you will have to implement your own way to zoom by changing the DisplayArea.
- MuPDFStructuredTextAddressSpan Selection [get, set]

  The start and end of the currently selected text.
- IBrush SelectionBrush [get, set]

  The colour used to highlight the Selection.
- IEnumerable< MuPDFStructuredTextAddressSpan > HighlightedRegions [get, set]

  A collection of highlighted regions, e.g. as a result of a text search.
- IBrush HighlightBrush [get, set]

  The colour used to highlight the HighlightedRegions.

7.20.1 Detailed Description

A control to render PDF documents (and other formats), potentally using multiple threads.

Definition at line 42 of file PDFRenderer.cs.

7.20.2 Member Enumeration Documentation

7.20.2.1 PointerEventHandlers

`enum MuPDFCore.MuPDFRenderer.PDFRenderer.PointerEventHandlers`

Identifies the action to perform on pointer events.

Enumerator

Pan	Pointer events will be used to pan around the page.
Highlight	Pointer events will be used to highlight text.
PanHighlight	Pointer events will be used to pan around the page or to highlight text, depending on where they start.
Custom	Pointer events will be ignored. If you use this value, you will have to implement your own way to pan around the document by changing the DisplayArea or to select text.

Definition at line 246 of file PDFRenderer.Properties.cs.

7.20.3 Constructor & Destructor Documentation

7.20.3.1 PDFRenderer()

```
MuPDFCore.MuPDFRenderer.PDFRenderer.PDFRenderer ( )
```

Initializes a new instance of the PDFRenderer class.

Definition at line 203 of file PDFRenderer.cs.

7.20.4 Member Function Documentation

7.20.4.1 Contain()

```
void MuPDFCore.MuPDFRenderer.PDFRenderer.Contain ( )
```

Alter the display area so that the whole page fits on screen.

Definition at line 698 of file PDFRenderer.cs.

7.20.4.2 Cover()

```
void MuPDFCore.MuPDFRenderer.PDFRenderer.Cover ( )
```

Alter the display area so that the page covers the whole surface of the PDFRenderer (even though parts of the page may be outside it).

Definition at line 707 of file PDFRenderer.cs.

7.20.4.3 GetProgress()

```
RenderProgress MuPDFCore.MuPDFRenderer.PDFRenderer.GetProgress ( )
```

Get the current rendering progress.

Returns

A RenderProgress object with information about the rendering progress of each thread.

Definition at line 728 of file PDFRenderer.cs.

7.20.4.4 GetSelectedText()

```
string MuPDFCore.MuPDFRenderer.PDFRenderer.GetSelectedText ( )
```

Get the currently selected text.

Returns

The currently selected text.

Definition at line 737 of file PDFRenderer.cs.

7.20.4.5 Initialize() [1/4]

```
void MuPDFCore.MuPDFRenderer.PDFRenderer.Initialize (
            byte[] dataBytes,
            InputFileTypes fileType,
            int offset = 0,
            int length = -1,
            int threadCount = 0,
            int pageNumber = 0,
            double resolutionMultiplier = 1,
            bool includeAnnotations = true,
            TesseractLanguage ocrLanguage = null )
```

Set up the PDFRenderer to display a page of a document that will be loaded from an array of bytes.

Parameters

dataBytes	The bytes of the document that should be opened. The array will be copied and can be safely discarded/altered after this method returns.
fileType	The format of the document.
offset	The offset in the byte array at which the document starts.
length	The length of the document in bytes. If this is < 0, the whole array is used.
threadCount	The number of threads to use in the rendering. If this is 0, an appropriate number of threads based on the number of processors in the computer will be used. Otherwise, this must be factorisable using only powers of 2, 3, 5 or 7. If this is not the case, the biggest number smaller than *threadCount* that satisfies this condition is used.
pageNumber	The index of the page that should be rendered. The first page has index 0.
resolutionMultiplier	This value can be used to increase or decrease the resolution at which the static renderisation of the page will be produced. If *resolutionMultiplier* is 1, the resolution will match the size (in screen units) of the PDFRenderer.
includeAnnotations	If this is `true`, annotations (e.g. signatures) are included in the rendering. Otherwise, only the page contents are included.
ocrLanguage	The language to use for optical character recognition (OCR). If this is null, no OCR is performed.

Definition at line 403 of file PDFRenderer.cs.

7.20.4.6 Initialize() [2/4]

```
void MuPDFCore.MuPDFRenderer.PDFRenderer.Initialize (
            MemoryStream ms,
            InputFileTypes fileType,
            int threadCount = 0,
            int pageNumber = 0,
            double resolutionMultiplier = 1,
            bool includeAnnotations = true,
            TesseractLanguage ocrLanguage = null )
```

Set up the PDFRenderer to display a page of a document that will be loaded from a MemoryStream.

Parameters

ms	The MemoryStream containing the document that should be opened. This can be safely disposed after this method returns.
fileType	The format of the document.
threadCount	The number of threads to use in the rendering. If this is 0, an appropriate number of threads based on the number of processors in the computer will be used. Otherwise, this must be factorisable using only powers of 2, 3, 5 or 7. If this is not the case, the biggest number smaller than *threadCount* that satisfies this condition is used.
pageNumber	The index of the page that should be rendered. The first page has index 0.
resolutionMultiplier	This value can be used to increase or decrease the resolution at which the static renderisation of the page will be produced. If *resolutionMultiplier* is 1, the resolution will match the size (in screen units) of the PDFRenderer.
includeAnnotations	If this is `true`, annotations (e.g. signatures) are included in the rendering. Otherwise, only the page contents are included.
ocrLanguage	The language to use for optical character recognition (OCR). If this is null, no OCR is performed.

Definition at line 359 of file PDFRenderer.cs.

7.20.4.7 Initialize() [3/4]

```
void MuPDFCore.MuPDFRenderer.PDFRenderer.Initialize (
            MuPDFDocument document,
            int threadCount = 0,
            int pageNumber = 0,
            double resolutionMultiplier = 1,
            bool includeAnnotations = true,
            TesseractLanguage ocrLanguage = null )
```

Set up the PDFRenderer to display a page of a MuPDFDocument.

Parameters

document	The MuPDFDocument to render.
threadCount	The number of threads to use in the rendering. If this is 0, an appropriate number of threads based on the number of processors in the computer will be used. Otherwise, this must be factorisable using only powers of 2, 3, 5 or 7. If this is not the case, the biggest number smaller than *threadCount* that satisfies this condition is used.

Parameters

pageNumber	The index of the page that should be rendered. The first page has index 0.
resolutionMultiplier	This value can be used to increase or decrease the resolution at which the static renderisation of the page will be produced. If *resolutionMultiplier* is 1, the resolution will match the size (in screen units) of the PDFRenderer.
includeAnnotations	If this is `true`, annotations (e.g. signatures) are included in the rendering. Otherwise, only the page contents are included.
ocrLanguage	The language to use for optical character recognition (OCR). If this is null, no OCR is performed.

Definition at line 258 of file PDFRenderer.cs.

7.20.4.8 Initialize() [4/4]

```
void MuPDFCore.MuPDFRenderer.PDFRenderer.Initialize (
            string fileName,
            int threadCount = 0,
            int pageNumber = 0,
            double resolutionMultiplier = 1,
            bool includeAnnotations = true,
            TesseractLanguage ocrLanguage = null )
```

Set up the PDFRenderer to display a page of a document that will be loaded from disk.

Parameters

fileName	The path to the document that should be opened.
threadCount	The number of threads to use in the rendering. If this is 0, an appropriate number of threads based on the number of processors in the computer will be used. Otherwise, this must be factorisable using only powers of 2, 3, 5 or 7. If this is not the case, the biggest number smaller than *threadCount* that satisfies this condition is used.
pageNumber	The index of the page that should be rendered. The first page has index 0.
resolutionMultiplier	This value can be used to increase or decrease the resolution at which the static renderisation of the page will be produced. If *resolutionMultiplier* is 1, the resolution will match the size (in screen units) of the PDFRenderer.
includeAnnotations	If this is `true`, annotations (e.g. signatures) are included in the rendering. Otherwise, only the page contents are included.
ocrLanguage	The language to use for optical character recognition (OCR). If this is null, no OCR is performed.

Definition at line 308 of file PDFRenderer.cs.

7.20.4.9 InitializeAsync() [1/4]

```
async Task MuPDFCore.MuPDFRenderer.PDFRenderer.InitializeAsync (
            byte[] dataBytes,
```

```
InputFileTypes fileType,
int offset = 0,
int length = -1,
int threadCount = 0,
int pageNumber = 0,
double resolutionMultiplier = 1,
bool includeAnnotations = true,
TesseractLanguage ocrLanguage = null,
CancellationToken ocrCancellationToken = default,
IProgress< OCRProgressInfo > ocrProgress = null )
```

Set up the PDFRenderer to display a page of a document that will be loaded from an array of bytes. The OCR step is run asynchronously, in order not to block the UI thread.

Parameters

dataBytes	The bytes of the document that should be opened. The array will be copied and can be safely discarded/altered after this method returns.
fileType	The format of the document.
offset	The offset in the byte array at which the document starts.
length	The length of the document in bytes. If this is < 0, the whole array is used.
threadCount	The number of threads to use in the rendering. If this is 0, an appropriate number of threads based on the number of processors in the computer will be used. Otherwise, this must be factorisable using only powers of 2, 3, 5 or 7. If this is not the case, the biggest number smaller than *threadCount* that satisfies this condition is used.
pageNumber	The index of the page that should be rendered. The first page has index 0.
resolutionMultiplier	This value can be used to increase or decrease the resolution at which the static renderisation of the page will be produced. If *resolutionMultiplier* is 1, the resolution will match the size (in screen units) of the PDFRenderer.
includeAnnotations	If this is `true`, annotations (e.g. signatures) are included in the rendering. Otherwise, only the page contents are included.
ocrLanguage	The language to use for optical character recognition (OCR). If this is null, no OCR is performed.
ocrCancellationToken	A CancellationToken used to cancel the OCR operation.
ocrProgress	An IProgress<OCRProgressInfo> used to report OCR progress.

Definition at line 446 of file PDFRenderer.cs.

7.20.4.10 InitializeAsync() [2/4]

```
async Task MuPDFCore.MuPDFRenderer.PDFRenderer.InitializeAsync (
            MemoryStream ms,
            InputFileTypes fileType,
            int threadCount = 0,
            int pageNumber = 0,
            double resolutionMultiplier = 1,
            bool includeAnnotations = true,
            TesseractLanguage ocrLanguage = null,
            CancellationToken ocrCancellationToken = default,
            IProgress< OCRProgressInfo > ocrProgress = null )
```

Set up the PDFRenderer to display a page of a document that will be loaded from a MemoryStream. The OCR step is run asynchronously, in order not to block the UI thread.

Parameters

ms	The MemoryStream containing the document that should be opened. This can be safely disposed after this method returns.
fileType	The format of the document.
threadCount	The number of threads to use in the rendering. If this is 0, an appropriate number of threads based on the number of processors in the computer will be used. Otherwise, this must be factorisable using only powers of 2, 3, 5 or 7. If this is not the case, the biggest number smaller than *threadCount* that satisfies this condition is used.
pageNumber	The index of the page that should be rendered. The first page has index 0.
resolutionMultiplier	This value can be used to increase or decrease the resolution at which the static renderisation of the page will be produced. If *resolutionMultiplier* is 1, the resolution will match the size (in screen units) of the PDFRenderer.
includeAnnotations	If this is `true`, annotations (e.g. signatures) are included in the rendering. Otherwise, only the page contents are included.
ocrLanguage	The language to use for optical character recognition (OCR). If this is null, no OCR is performed.
ocrCancellationToken	A CancellationToken used to cancel the OCR operation.
ocrProgress	An IProgress<OCRProgressInfo> used to report OCR progress.

Definition at line 381 of file PDFRenderer.cs.

7.20.4.11 InitializeAsync() [3/4]

```
async Task MuPDFCore.MuPDFRenderer.PDFRenderer.InitializeAsync (
            MuPDFDocument document,
            int threadCount = 0,
            int pageNumber = 0,
            double resolutionMultiplier = 1,
            bool includeAnnotations = true,
            TesseractLanguage ocrLanguage = null,
            CancellationToken ocrCancellationToken = default,
            IProgress< OCRProgressInfo > ocrProgress = null )
```

Set up the PDFRenderer to display a page of a MuPDFDocument. The OCR step is run asynchronously, in order not to block the UI thread.

Parameters

document	The MuPDFDocument to render.
threadCount	The number of threads to use in the rendering. If this is 0, an appropriate number of threads based on the number of processors in the computer will be used. Otherwise, this must be factorisable using only powers of 2, 3, 5 or 7. If this is not the case, the biggest number smaller than *threadCount* that satisfies this condition is used.
pageNumber	The index of the page that should be rendered. The first page has index 0.
resolutionMultiplier	This value can be used to increase or decrease the resolution at which the static renderisation of the page will be produced. If *resolutionMultiplier* is 1, the resolution will match the size (in screen units) of the PDFRenderer.
includeAnnotations	If this is `true`, annotations (e.g. signatures) are included in the rendering. Otherwise, only the page contents are included.
ocrLanguage	The language to use for optical character recognition (OCR). If this is null, no OCR is performed.
ocrCancellationToken	A CancellationToken used to cancel the OCR operation.
ocrProgress	An IProgress<OCRProgressInfo> used to report OCR progress.

Definition at line 284 of file PDFRenderer.cs.

7.20.4.12 InitializeAsync() [4/4]

```
async Task MuPDFCore.MuPDFRenderer.PDFRenderer.InitializeAsync (
            string fileName,
            int threadCount = 0,
            int pageNumber = 0,
            double resolutionMultiplier = 1,
            bool includeAnnotations = true,
            TesseractLanguage ocrLanguage = null,
            CancellationToken ocrCancellationToken = default,
            IProgress< OCRProgressInfo > ocrProgress = null )
```

Set up the PDFRenderer to display a page of a document that will be loaded from disk. The OCR step is run asynchronously, in order not to block the UI thread.

Parameters

fileName	The path to the document that should be opened.
threadCount	The number of threads to use in the rendering. If this is 0, an appropriate number of threads based on the number of processors in the computer will be used. Otherwise, this must be factorisable using only powers of 2, 3, 5 or 7. If this is not the case, the biggest number smaller than *threadCount* that satisfies this condition is used.
pageNumber	The index of the page that should be rendered. The first page has index 0.
resolutionMultiplier	This value can be used to increase or decrease the resolution at which the static renderisation of the page will be produced. If *resolutionMultiplier* is 1, the resolution will match the size (in screen units) of the PDFRenderer.
includeAnnotations	If this is `true`, annotations (e.g. signatures) are included in the rendering. Otherwise, only the page contents are included.
ocrLanguage	The language to use for optical character recognition (OCR). If this is null, no OCR is performed.
ocrCancellationToken	A CancellationToken used to cancel the OCR operation.
ocrProgress	An IProgress<OCRProgressInfo> used to report OCR progress.

Definition at line 334 of file PDFRenderer.cs.

7.20.4.13 ReleaseResources()

```
void MuPDFCore.MuPDFRenderer.PDFRenderer.ReleaseResources ( )
```

Release resources held by this PDFRenderer. This is not an irreversible step: using one of the Initialize overloads after calling this method will restore functionality.

Definition at line 619 of file PDFRenderer.cs.

7.20.4.14 Render()

```
override void MuPDFCore.MuPDFRenderer.PDFRenderer.Render (
            DrawingContext context )
```

Draw the rendered document.

Parameters

context	The drawing context on which to draw.

Definition at line 1299 of file PDFRenderer.cs.

7.20.4.15 Search()

```
int MuPDFCore.MuPDFRenderer.PDFRenderer.Search (
            Regex needle )
```

Highlights all matches of the specified Regex in the text and returns the number of matches found. Matches cannot span multiple lines.

Parameters

needle	The Regex to search for.

Returns

The number of matches that have been found.

Definition at line 766 of file PDFRenderer.cs.

7.20.4.16 SelectAll()

```
void MuPDFCore.MuPDFRenderer.PDFRenderer.SelectAll ( )
```

Selects all the text in the document.

Definition at line 745 of file PDFRenderer.cs.

7.20.4.17 SetDisplayAreaNow()

```
void MuPDFCore.MuPDFRenderer.PDFRenderer.SetDisplayAreaNow (
            Rect value )
```

Set the current display area to the specified *value* , skipping all transitions.

Parameters

value	The new display area.

Definition at line 660 of file PDFRenderer.cs.

7.20.4.18 ZoomStep()

```
void MuPDFCore.MuPDFRenderer.PDFRenderer.ZoomStep (
            double count,
            Point?  center = null )
```

Zoom around a point.

Parameters

count	Number of steps to zoom. Positive values indicate a zoom in, negative values a zoom out.
center	The point around which to center the zoom operation. If this is null, the center of the control is used.

Definition at line 673 of file PDFRenderer.cs.

7.20.5 Member Data Documentation

7.20.5.1 BackgroundProperty

```
readonly StyledProperty<IBrush> MuPDFCore.MuPDFRenderer.PDFRenderer.BackgroundProperty =
AvaloniaProperty.Register<PDFRenderer, IBrush>(nameof(Background))  [static]
```

Defines the Background property.

Definition at line 182 of file PDFRenderer.Properties.cs.

7.20.5.2 DisplayAreaProperty

```
readonly StyledProperty<Rect> MuPDFCore.MuPDFRenderer.PDFRenderer.DisplayAreaProperty = Avalonia↩
Property.Register<PDFRenderer, Rect>(nameof(DisplayArea))  [static]
```

Defines the DisplayArea property.

Definition at line 128 of file PDFRenderer.Properties.cs.

7.20.5.3 HighlightBrushProperty

```
readonly StyledProperty<IBrush> MuPDFCore.MuPDFRenderer.PDFRenderer.HighlightBrushProperty
= AvaloniaProperty.Register<PDFRenderer, IBrush>(nameof(HighlightBrush), new SolidColor↩
Brush(Color.FromArgb(96, 230, 159, 0)))  [static]
```

Defines the HighlightBrush property.

Definition at line 337 of file PDFRenderer.Properties.cs.

7.20.5.4 HighlightedRegionsProperty

```
readonly StyledProperty<IEnumerable<MuPDFStructuredTextAddressSpan> > MuPDFCore.MuPDFRenderer.↩
PDFRenderer.HighlightedRegionsProperty = AvaloniaProperty.Register<PDFRenderer, IEnumerable<MuPDFStructuredTe
null)  [static]
```

Defines the HighlightedRegions property.

Definition at line 324 of file PDFRenderer.Properties.cs.

7.20.5.5 IsViewerInitializedProperty

```
readonly DirectProperty<PDFRenderer, bool> MuPDFCore.MuPDFRenderer.PDFRenderer.IsViewer↩
InitializedProperty = AvaloniaProperty.RegisterDirect<PDFRenderer, bool>(nameof(IsViewerInitialized),
o => o.IsViewerInitialized)  [static]
```

Defines the IsViewerInitialized property.

Definition at line 80 of file PDFRenderer.Properties.cs.

7.20.5.6 PageBackgroundProperty

```
readonly StyledProperty<IBrush> MuPDFCore.MuPDFRenderer.PDFRenderer.PageBackgroundProperty =
AvaloniaProperty.Register<PDFRenderer, IBrush>(nameof(PageBackground))  [static]
```

Defines the PageBackground property.

Definition at line 195 of file PDFRenderer.Properties.cs.

7.20.5.7 PageNumberProperty

```
readonly DirectProperty<PDFRenderer, int> MuPDFCore.MuPDFRenderer.PDFRenderer.PageNumber↩
Property = AvaloniaProperty.RegisterDirect<PDFRenderer, int>(nameof(PageNumber), o => o.↩
PageNumber)  [static]
```

Defines the PageNumber property.

Definition at line 56 of file PDFRenderer.Properties.cs.

7.20.5.8 PageSizeProperty

```
readonly DirectProperty<PDFRenderer, Rect> MuPDFCore.MuPDFRenderer.PDFRenderer.PageSize↩
Property = AvaloniaProperty.RegisterDirect<PDFRenderer, Rect>(nameof(PageSize), o => o.Page↩
Size)  [static]
```

Defines the PageSize property.

Definition at line 104 of file PDFRenderer.Properties.cs.

7.20.5.9 PointerEventHandlerTypeProperty

```
readonly StyledProperty<PointerEventHandlers> MuPDFCore.MuPDFRenderer.PDFRenderer.Pointer↩
EventHandlerTypeProperty = AvaloniaProperty.Register<PDFRenderer, PointerEventHandlers>(nameof(PointerEventHa
PointerEventHandlers.PanHighlight)  [static]
```

Defines the PointerEventHandlersType property.

Definition at line 272 of file PDFRenderer.Properties.cs.

7.20.5.10 RenderThreadCountProperty

```
readonly DirectProperty<PDFRenderer, int> MuPDFCore.MuPDFRenderer.PDFRenderer.RenderThread↩
CountProperty = AvaloniaProperty.RegisterDirect<PDFRenderer, int>(nameof(RenderThreadCount), o
=> o.RenderThreadCount)  [static]
```

Defines the RenderThreadCount property.

Definition at line 32 of file PDFRenderer.Properties.cs.

7.20.5.11 SelectionBrushProperty

```
readonly StyledProperty<IBrush> MuPDFCore.MuPDFRenderer.PDFRenderer.SelectionBrushProperty
= AvaloniaProperty.Register<PDFRenderer, IBrush>(nameof(SelectionBrush), new SolidColor↩
Brush(Color.FromArgb(96, 86, 180, 233)))  [static]
```

Defines the SelectionBrush property.

Definition at line 311 of file PDFRenderer.Properties.cs.

7.20.5.12 SelectionProperty

```
readonly StyledProperty<MuPDFStructuredTextAddressSpan> MuPDFCore.MuPDFRenderer.PDFRenderer.↩
SelectionProperty = AvaloniaProperty.Register<PDFRenderer, MuPDFStructuredTextAddressSpan>(nameof(Selection),
null)  [static]
```

Defines the Selection property.

Definition at line 298 of file PDFRenderer.Properties.cs.

7.20.5.13 ZoomEnabledProperty

```
readonly StyledProperty<bool> MuPDFCore.MuPDFRenderer.PDFRenderer.ZoomEnabledProperty = Avalonia↩
Property.Register<PDFRenderer, bool>(nameof(ZoomEnabled), true)  [static]
```

Defines the ZoomEnabled property.

Definition at line 285 of file PDFRenderer.Properties.cs.

7.20.5.14 ZoomIncrementProperty

```
readonly StyledProperty<double> MuPDFCore.MuPDFRenderer.PDFRenderer.ZoomIncrementProperty =
AvaloniaProperty.Register<PDFRenderer, double>(nameof(ZoomIncrement), Math.Pow(2, 1.0 / 3.0),
defaultBindingMode:  Avalonia.Data.BindingMode.TwoWay)  [static]
```

Defines the ZoomIncrement property.

Definition at line 160 of file PDFRenderer.Properties.cs.

7.20.5.15 ZoomProperty

```
readonly DirectProperty<PDFRenderer, double> MuPDFCore.MuPDFRenderer.PDFRenderer.ZoomProperty
= AvaloniaProperty.RegisterDirect<PDFRenderer, double>(nameof(Zoom), o => o.Zoom, (o, v) =>
o.Zoom = v, defaultBindingMode:  Avalonia.Data.BindingMode.TwoWay)  [static]
```

Defines the Zoom property.

Definition at line 208 of file PDFRenderer.Properties.cs.

7.20.6 Property Documentation

7.20.6.1 Background

```
IBrush MuPDFCore.MuPDFRenderer.PDFRenderer.Background  [get], [set]
```

The background colour of the control.

Definition at line 186 of file PDFRenderer.Properties.cs.

7.20.6.2 DisplayArea

```
Rect MuPDFCore.MuPDFRenderer.PDFRenderer.DisplayArea  [get], [set]
```

The region of the page (in page units) that is currently displayed by the current instance. This always has the same aspect ratio of the bounds of this control. When this is set, the value is sanitised so that the smallest rectangle with the correct aspect ratio containing the requested value is chosen.

Definition at line 133 of file PDFRenderer.Properties.cs.

7.20.6.3 HighlightBrush

```
IBrush MuPDFCore.MuPDFRenderer.PDFRenderer.HighlightBrush  [get], [set]
```

The colour used to highlight the HighlightedRegions.

Definition at line 341 of file PDFRenderer.Properties.cs.

7.20.6.4 HighlightedRegions

```
IEnumerable<MuPDFStructuredTextAddressSpan> MuPDFCore.MuPDFRenderer.PDFRenderer.Highlighted↩
Regions  [get], [set]
```

A collection of highlighted regions, e.g. as a result of a text search.

Definition at line 328 of file PDFRenderer.Properties.cs.

7.20.6.5 IsViewerInitialized

```
bool MuPDFCore.MuPDFRenderer.PDFRenderer.IsViewerInitialized  [get]
```

Whether the current instance has been initialised with a document to render or not. Read-only.

Definition at line 88 of file PDFRenderer.Properties.cs.

7.20.6.6 PageBackground

```
IBrush MuPDFCore.MuPDFRenderer.PDFRenderer.PageBackground  [get], [set]
```

The background colour to use for the page drawn by the control.

Definition at line 199 of file PDFRenderer.Properties.cs.

7.20.6.7 PageNumber

```
int MuPDFCore.MuPDFRenderer.PDFRenderer.PageNumber  [get]
```

Exposes the number of the page that the current instance is rendering. Read-only.

Definition at line 64 of file PDFRenderer.Properties.cs.

7.20.6.8 PageSize

```
Rect MuPDFCore.MuPDFRenderer.PDFRenderer.PageSize  [get]
```

Exposes the size of the page that is drawn by the current instance (in page units).

Definition at line 112 of file PDFRenderer.Properties.cs.

7.20.6.9 PointerEventHandlersType

```
PointerEventHandlers MuPDFCore.MuPDFRenderer.PDFRenderer.PointerEventHandlersType  [get], [set]
```

Whether the default handlers for pointer events (which are used for panning around the page) should be enabled. If this is false, you will have to implement your own way to pan around the document by changing the DisplayArea.

Definition at line 276 of file PDFRenderer.Properties.cs.

7.20.6.10 RenderThreadCount

```
int MuPDFCore.MuPDFRenderer.PDFRenderer.RenderThreadCount  [get]
```

Exposes the number of threads that the current instance is using to render the document. Read-only.

Definition at line 40 of file PDFRenderer.Properties.cs.

7.20.6.11 Selection

```
MuPDFStructuredTextAddressSpan MuPDFCore.MuPDFRenderer.PDFRenderer.Selection  [get], [set]
```

The start and end of the currently selected text.

Definition at line 302 of file PDFRenderer.Properties.cs.

7.20.6.12 SelectionBrush

```
IBrush MuPDFCore.MuPDFRenderer.PDFRenderer.SelectionBrush  [get], [set]
```

The colour used to highlight the Selection.

Definition at line 315 of file PDFRenderer.Properties.cs.

7.20.6.13 Zoom

```
double MuPDFCore.MuPDFRenderer.PDFRenderer.Zoom  [get], [set]
```

The current zoom level. Setting this will change the DisplayArea appropriately, zooming around the center of the DisplayArea.

Definition at line 216 of file PDFRenderer.Properties.cs.

7.20.6.14 ZoomEnabled

```
bool MuPDFCore.MuPDFRenderer.PDFRenderer.ZoomEnabled  [get], [set]
```

Whether the default handlers for pointer wheel events (which are used for zooming in/out) should be enabled. If this is false, you will have to implement your own way to zoom by changing the DisplayArea.

Definition at line 289 of file PDFRenderer.Properties.cs.

7.20.6.15 ZoomIncrement

```
double MuPDFCore.MuPDFRenderer.PDFRenderer.ZoomIncrement  [get], [set]
```

Determines by how much the scale will be increased/decreased by the ZoomStep(double, Point?) method. Set this to a value smaller than 1 to invert the zoom in/out direction.

Definition at line 164 of file PDFRenderer.Properties.cs.

The documentation for this class was generated from the following files:

- MuPDFCore.MuPDFRenderer/PDFRenderer.cs
- MuPDFCore.MuPDFRenderer/PDFRenderer.Properties.cs

7.21 MuPDFCore.PointF Struct Reference

Represents a point.

Public Member Functions

- PointF (float x, float y)

  Create a new PointF from the specified coordinates.

Public Attributes

- float X

  The horizontal coordinate of the point.
- float Y

  The vertical coordinate of the point.

7.21.1 Detailed Description

Represents a point.

Definition at line 566 of file Rectangles.cs.

7.21.2 Constructor & Destructor Documentation

7.21.2.1 PointF()

```
MuPDFCore.PointF.PointF (
            float x,
            float y )
```

Create a new PointF from the specified coordinates.

Parameters

x	The horizontal coordinate of the point.
y	The vertical coordinate of the point.

Definition at line 583 of file Rectangles.cs.

7.21.3 Member Data Documentation

7.21.3.1 X

```
float MuPDFCore.PointF.X
```

The horizontal coordinate of the point.

Definition at line 571 of file Rectangles.cs.

7.21.3.2 Y

```
float MuPDFCore.PointF.Y
```

The vertical coordinate of the point.

Definition at line 576 of file Rectangles.cs.

The documentation for this struct was generated from the following file:

- MuPDFCore/Rectangles.cs

7.22 MuPDFCore.Quad Struct Reference

Represents a quadrilater (not necessarily a rectangle).

Public Member Functions

- Quad (PointF lowerLeft, PointF upperLeft, PointF upperRight, PointF lowerRight)

  Creates a new Quad from the specified points.
- bool Contains (PointF point)

  Checks whether this Quad contains a PointF.

Public Attributes

- PointF LowerLeft

  The lower left point of the quadrilater.
- PointF UpperLeft

  The upper left point of the quadrilater.
- PointF UpperRight

  The upper right point of the quadrilater.
- PointF LowerRight

  The lower right point of the quadrilater.

7.22.1 Detailed Description

Represents a quadrilater (not necessarily a rectangle).

Definition at line 593 of file Rectangles.cs.

7.22.2 Constructor & Destructor Documentation

7.22.2.1 Quad()

```
MuPDFCore.Quad.Quad (
            PointF lowerLeft,
            PointF upperLeft,
            PointF upperRight,
            PointF lowerRight )
```

Creates a new Quad from the specified points.

Parameters

lowerLeft	The lower left point of the quadrilater.
upperLeft	The upper left point of the quadrilater.
upperRight	The upper right point of the quadrilater.
lowerRight	The lower right point of the quadrilater.

Definition at line 622 of file Rectangles.cs.

7.22.3 Member Function Documentation

7.22.3.1 Contains()

```
bool MuPDFCore.Quad.Contains (
            PointF point )
```

Checks whether this Quad contains a PointF.

Parameters

point	The PointF to check.

Returns

A boolean value indicating whether this Quad contains the *point* .

Definition at line 635 of file Rectangles.cs.

7.22.4 Member Data Documentation

7.22.4.1 LowerLeft

```
PointF MuPDFCore.Quad.LowerLeft
```

The lower left point of the quadrilater.

Definition at line 598 of file Rectangles.cs.

7.22.4.2 LowerRight

```
PointF MuPDFCore.Quad.LowerRight
```

The lower right point of the quadrilater.

Definition at line 613 of file Rectangles.cs.

7.22.4.3 UpperLeft

```
PointF MuPDFCore.Quad.UpperLeft
```

The upper left point of the quadrilater.

Definition at line 603 of file Rectangles.cs.

7.22.4.4 UpperRight

```
PointF MuPDFCore.Quad.UpperRight
```

The upper right point of the quadrilater.

Definition at line 608 of file Rectangles.cs.

The documentation for this struct was generated from the following file:

- MuPDFCore/Rectangles.cs

7.23 MuPDFCore.Rectangle Struct Reference

Represents a rectangle.

Public Member Functions

- Rectangle (float x0, float y0, float x1, float y1)

  Create a new Rectangle from the specified coordinates.
- Rectangle (double x0, double y0, double x1, double y1)

  Create a new Rectangle from the specified coordinates.
- RoundedRectangle Round ()

  Round the rectangle's coordinates to the closest integers.
- RoundedRectangle Round (double zoom)

  Round the rectangle's coordinates to the closest integers, applying the specified zoom factor.
- Rectangle[ ] Split (int divisions)

  Split the rectangle into the specified number of Rectangles.
- Rectangle Intersect (Rectangle other)

  Compute the intersection between this Rectangle and another one.
- bool Contains (Rectangle other)

  Checks whether this Rectangle contains another Rectangle.
- bool Contains (PointF point)

  Checks whether this Rectangle contains a PointF.
- Quad ToQuad ()

  Converts the Rectangle to a Quad.

Public Attributes

- float X0

  The left coordinate of the rectangle.
- float Y0

  The top coordinate of the rectangle.
- float X1

  The right coordinate of the rectangle.
- float Y1

  The bottom coordinate of the rectangle.

Properties

- float Width [get]

  The width of the rectangle.
- float Height [get]

  The height of the rectangle.

7.23.1 Detailed Description

Represents a rectangle.

Definition at line 326 of file Rectangles.cs.

7.23.2 Constructor & Destructor Documentation

7.23.2.1 Rectangle() [1/2]

```
MuPDFCore.Rectangle.Rectangle (
            float x0,
            float y0,
            float x1,
            float y1 )
```

Create a new Rectangle from the specified coordinates.

Parameters

x0	The left coordinate of the rectangle.
y0	The top coordinate of the rectangle.
x1	The right coordinate of the rectangle.
y1	The bottom coordinate of the rectangle.

Definition at line 365 of file Rectangles.cs.

7.23.2.2 Rectangle() [2/2]

```
MuPDFCore.Rectangle.Rectangle (
            double x0,
            double y0,
            double x1,
            double y1 )
```

Create a new Rectangle from the specified coordinates.

Parameters

x0	The left coordinate of the rectangle.
y0	The top coordinate of the rectangle.
x1	The right coordinate of the rectangle.
y1	The bottom coordinate of the rectangle.

Definition at line 380 of file Rectangles.cs.

7.23.3 Member Function Documentation

7.23.3.1 Contains() [1/2]

```
bool MuPDFCore.Rectangle.Contains (
            PointF point )
```

Checks whether this Rectangle contains a PointF.

Parameters

point	The PointF to check.

Returns

A boolean value indicating whether this Rectangle contains the *point* .

Definition at line 476 of file Rectangles.cs.

7.23.3.2 Contains() [2/2]

```
bool MuPDFCore.Rectangle.Contains (
            Rectangle other )
```

Checks whether this Rectangle contains another Rectangle.

Parameters

other	The Rectangle to check.

Returns

A boolean value indicating whether this Rectangle contains the *other* Rectangle.

Definition at line 466 of file Rectangles.cs.

7.23.3.3 Intersect()

```
Rectangle MuPDFCore.Rectangle.Intersect (
            Rectangle other )
```

Compute the intersection between this Rectangle and another one.

Parameters

other	The other Rectangle to intersect with this instance.

Returns

The intersection between the two Rectangles.

Definition at line 443 of file Rectangles.cs.

7.23.3.4 Round() [1/2]

```
RoundedRectangle MuPDFCore.Rectangle.Round ( )
```

Round the rectangle's coordinates to the closest integers.

Returns

A RoundedRectangle with the rounded coordinates.

Definition at line 392 of file Rectangles.cs.

7.23.3.5 Round() [2/2]

```
RoundedRectangle MuPDFCore.Rectangle.Round (
            double zoom )
```

Round the rectangle's coordinates to the closest integers, applying the specified zoom factor.

Parameters

zoom	The zoom factor to apply.

Returns

A RoundedRectangle with the rounded coordinates.

Definition at line 407 of file Rectangles.cs.

7.23.3.6 Split()

```
Rectangle[] MuPDFCore.Rectangle.Split (
            int divisions )
```

Split the rectangle into the specified number of Rectangles.

Parameters

divisions	The number of rectangles in which the rectangle should be split. This must be factorisable using only powers of 2, 3, 5 or 7. Otherwise, the biggest number smaller than *divisions* that satisfies this condition is used.

Returns

An array of Rectangles that when positioned properly cover the same area as this object.

Definition at line 422 of file Rectangles.cs.

7.23.3.7 ToQuad()

```
Quad MuPDFCore.Rectangle.ToQuad ( )
```

Converts the Rectangle to a Quad.

Returns

A Quad corresponding to the current Rectangle.

Definition at line 485 of file Rectangles.cs.

7.23.4 Member Data Documentation

7.23.4.1 X0

```
float MuPDFCore.Rectangle.X0
```

The left coordinate of the rectangle.

Definition at line 331 of file Rectangles.cs.

7.23.4.2 X1

```
float MuPDFCore.Rectangle.X1
```

The right coordinate of the rectangle.

Definition at line 341 of file Rectangles.cs.

7.23.4.3 Y0

```
float MuPDFCore.Rectangle.Y0
```

The top coordinate of the rectangle.

Definition at line 336 of file Rectangles.cs.

7.23.4.4 Y1

```
float MuPDFCore.Rectangle.Y1
```

The bottom coordinate of the rectangle.

Definition at line 346 of file Rectangles.cs.

7.23.5 Property Documentation

7.23.5.1 Height

```
float MuPDFCore.Rectangle.Height  [get]
```

The height of the rectangle.

Definition at line 356 of file Rectangles.cs.

7.23.5.2 Width

```
float MuPDFCore.Rectangle.Width  [get]
```

The width of the rectangle.

Definition at line 351 of file Rectangles.cs.

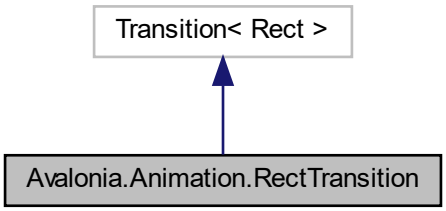
The documentation for this struct was generated from the following file:

- MuPDFCore/Rectangles.cs

7.24 Avalonia.Animation.RectTransition Class Reference

Transition class that handles AvaloniaProperty with Rect types.

Inheritance diagram for Avalonia.Animation.RectTransition:



Public Member Functions

- override IObservable< Rect > DoTransition (IObservable< double > progress, Rect oldValue, Rect new↩ Value)

7.24.1 Detailed Description

Transition class that handles AvaloniaProperty with Rect types.

Definition at line 26 of file RectTransition.cs.

7.24.2 Member Function Documentation

7.24.2.1 DoTransition()

```
override IObservable< Rect > Avalonia.Animation.RectTransition.DoTransition (
            IObservable< double > progress,
            Rect oldValue,
            Rect newValue )
```

Definition at line 29 of file RectTransition.cs.

The documentation for this class was generated from the following file:

- MuPDFCore.MuPDFRenderer/RectTransition.cs

7.25 MuPDFCore.RenderProgress Class Reference

Holds a summary of the progress of the current rendering operation.

Classes

- struct ThreadRenderProgress

  Holds the progress of a single thread.

Properties

- ThreadRenderProgress[] ThreadRenderProgresses `[get]`

  Contains the progress of all the threads used in rendering the document.

7.25.1 Detailed Description

Holds a summary of the progress of the current rendering operation.

Definition at line 368 of file MuPDF.cs.

7.25.2 Property Documentation

7.25.2.1 ThreadRenderProgresses

```
ThreadRenderProgress [] MuPDFCore.RenderProgress.ThreadRenderProgresses  [get]
```

Contains the progress of all the threads used in rendering the document.

Definition at line 395 of file MuPDF.cs.

The documentation for this class was generated from the following file:

- MuPDFCore/MuPDF.cs

7.26 MuPDFCore.RoundedRectangle Struct Reference

Represents a rectangle using only integer numbers.

Public Member Functions

- RoundedRectangle (int x0, int y0, int x1, int y1)

  Create a new RoundedRectangle from the specified coordinates.
- RoundedRectangle[ ] Split (int divisions)

  Split the rectangle into the specified number of RoundedRectangles.

Public Attributes

- int X0

  The left coordinate of the rectangle.
- int Y0

  The top coordinate of the rectangle.
- int X1

  The right coordinate of the rectangle.
- int Y1

  The bottom coordinate of the rectangle.

Properties

- int Width `[get]`

  The width of the rectangle.
- int Height `[get]`

  The height of the rectangle.

7.26.1 Detailed Description

Represents a rectangle using only integer numbers.

Definition at line 494 of file Rectangles.cs.

7.26.2 Constructor & Destructor Documentation

7.26.2.1 RoundedRectangle()

```
MuPDFCore.RoundedRectangle.RoundedRectangle (
            int x0,
            int y0,
            int x1,
            int y1 )
```

Create a new RoundedRectangle from the specified coordinates.

Parameters

x0	The left coordinate of the rectangle.
y0	The top coordinate of the rectangle.
x1	The right coordinate of the rectangle.
y1	The bottom coordinate of the rectangle.

Definition at line 533 of file Rectangles.cs.

7.26.3 Member Function Documentation

7.26.3.1 Split()

```
RoundedRectangle[] MuPDFCore.RoundedRectangle.Split (
            int divisions )
```

Split the rectangle into the specified number of RoundedRectangles.

Parameters

divisions	The number of rectangles in which the rectangle should be split. This must be factorisable using only powers of 2, 3, 5 or 7. Otherwise, the biggest number smaller than *divisions* that satisfies this condition is used.

Returns

An array of RoundedRectangles that when positioned properly cover the same area as this object.

Definition at line 546 of file Rectangles.cs.

7.26.4 Member Data Documentation

7.26.4.1 X0

```
int MuPDFCore.RoundedRectangle.X0
```

The left coordinate of the rectangle.

Definition at line 499 of file Rectangles.cs.

7.26.4.2 X1

```
int MuPDFCore.RoundedRectangle.X1
```

The right coordinate of the rectangle.

Definition at line 509 of file Rectangles.cs.

7.26.4.3 Y0

```
int MuPDFCore.RoundedRectangle.Y0
```

The top coordinate of the rectangle.

Definition at line 504 of file Rectangles.cs.

7.26.4.4 Y1

```
int MuPDFCore.RoundedRectangle.Y1
```

The bottom coordinate of the rectangle.

Definition at line 514 of file Rectangles.cs.

7.26.5 Property Documentation

7.26.5.1 Height

```
int MuPDFCore.RoundedRectangle.Height  [get]
```

The height of the rectangle.

Definition at line 524 of file Rectangles.cs.

7.26.5.2 Width

```
int MuPDFCore.RoundedRectangle.Width  [get]
```

The width of the rectangle.

Definition at line 519 of file Rectangles.cs.

The documentation for this struct was generated from the following file:

- MuPDFCore/Rectangles.cs

7.27 MuPDFCore.RoundedSize Struct Reference

Represents the size of a rectangle using only integer numbers.

Public Member Functions

- RoundedSize (int width, int height)

  Create a new RoundedSize with the specified width and height.
- RoundedRectangle[] Split (int divisions)

  Split the size into the specified number of RoundedRectangles.

Public Attributes

- int Width

  The width of the rectangle.
- int Height

  The height of the rectangle.

7.27.1 Detailed Description

Represents the size of a rectangle using only integer numbers.

Definition at line 181 of file Rectangles.cs.

7.27.2 Constructor & Destructor Documentation

7.27.2.1 RoundedSize()

```
MuPDFCore.RoundedSize.RoundedSize (
            int width,
            int height )
```

Create a new RoundedSize with the specified width and height.

Parameters

width	The width of the rectangle.
height	The height of the rectangle.

Definition at line 198 of file Rectangles.cs.

7.27.3 Member Function Documentation

7.27.3.1 Split()

```
RoundedRectangle[] MuPDFCore.RoundedSize.Split (
            int divisions )
```

Split the size into the specified number of RoundedRectangles.

Parameters

divisions	The number of rectangles in which the size should be split. This must be factorisable using only powers of 2, 3, 5 or 7. Otherwise, the biggest number smaller than *divisions* that satisfies this condition is used.

Returns

An array of RoundedRectangles that when positioned properly cover an area of the size of this object.

Definition at line 209 of file Rectangles.cs.

7.27.4 Member Data Documentation

7.27.4.1 Height

```
int MuPDFCore.RoundedSize.Height
```

The height of the rectangle.

Definition at line 191 of file Rectangles.cs.

7.27.4.2 Width

```
int MuPDFCore.RoundedSize.Width
```

The width of the rectangle.

Definition at line 186 of file Rectangles.cs.

The documentation for this struct was generated from the following file:

- MuPDFCore/Rectangles.cs

7.28 MuPDFCore.Size Struct Reference

Represents the size of a rectangle.

Public Member Functions

- Size (float width, float height)

  Create a new Size with the specified width and height.
- Size (double width, double height)

  Create a new Size with the specified width and height.
- Rectangle[ ] Split (int divisions)

  Split the size into the specified number of Rectangles.

Public Attributes

- float Width

  The width of the rectangle.
- float Height

  The height of the rectangle.

7.28.1 Detailed Description

Represents the size of a rectangle.

Definition at line 25 of file Rectangles.cs.

7.28.2 Constructor & Destructor Documentation

7.28.2.1 Size() [1/2]

```
MuPDFCore.Size.Size (
            float width,
            float height )
```

Create a new Size with the specified width and height.

Parameters

width	The width of the rectangle.
height	The height of the rectangle.

Definition at line 42 of file Rectangles.cs.

7.28.2.2 Size() [2/2]

```
MuPDFCore.Size.Size (
            double width,
            double height )
```

Create a new Size with the specified width and height.

Parameters

width	The width of the rectangle.
height	The height of the rectangle.

Definition at line 53 of file Rectangles.cs.

7.28.3 Member Function Documentation

7.28.3.1 Split()

```
Rectangle[] MuPDFCore.Size.Split (
            int divisions )
```

Split the size into the specified number of Rectangles.

Parameters

divisions	The number of rectangles in which the size should be split. This must be factorisable using only powers of 2, 3, 5 or 7. Otherwise, the biggest number smaller than *divisions* that satisfies this condition is used.

Returns

An array of Rectangles that when positioned properly cover an area of the size of this object.

Definition at line 64 of file Rectangles.cs.

7.28.4 Member Data Documentation

7.28.4.1 Height

```
float MuPDFCore.Size.Height
```

The height of the rectangle.

Definition at line 35 of file Rectangles.cs.

7.28.4.2 Width

```
float MuPDFCore.Size.Width
```

The width of the rectangle.

Definition at line 30 of file Rectangles.cs.

The documentation for this struct was generated from the following file:

- MuPDFCore/Rectangles.cs

7.29 MuPDFCore.TesseractLanguage Class Reference

Represents a language used by Tesseract OCR.

Public Types

- enum Fast {
  Afr , Amh , Ara , Asm ,
  Aze , Aze_Cyrl , Bel , Ben ,
  Bod , Bos , Bre , Bul ,
  Cat , Ceb , Ces , Chi_Sim ,
  Chi_Sim_Vert , Chi_Tra , Chi_Tra_Vert , Chr ,
  Cos , Cym , Dan , Deu ,
  Div , Dzo , Ell , Eng ,
  Enm , Epo , Equ , Est ,
  Eus , Fao , Fas , Fil ,
  Fin , Fra , Frk , Frm ,
  Fry , Gla , Gle , Glg ,
  Grc , Guj , Hat , Heb ,
  Hin , Hrv , Hun , Hye ,
  Iku , Ind , Isl , Ita ,
  Ita_Old , Jav , Jpn , Jpn_Vert ,
  Kan , Kat , Kat_Old , Kaz ,
  Khm , Kir , Kmr , Kor ,
  Kor_Vert , Lao , Lat , Lav ,
  Lit , Ltz , Mal , Mar ,
  Mkd , Mlt , Mon , Mri ,
  Msa , Mya , Nep , Nld ,
  Nor , Oci , Ori , Osd ,
  Pan , Pol , Por , Pus ,
  Que , Ron , Rus , San ,
  Sin , Slk , Slv , Snd ,
  Spa , Spa_Old , Sqi , Srp ,
  Srp_Latn , Sun , Swa , Swe ,
  Syr , Tam , Tat , Tel ,
  Tgk , Tha , Tir , Ton ,
  Tur , Uig , Ukr , Urd ,
  Uzb , Uzb_Cyrl , Vie , Yid ,
  Yor }

  Fast integer versions of trained models. These are models for a single language.

- enum FastScripts {
  Arabic , Armenian , Bengali , Canadian_Aboriginal ,
  Cherokee , Cyrillic , Devanagari , Ethiopic ,
  Fraktur , Georgian , Greek , Gujarati ,
  Gurmukhi , HanS , HanS_Vert , HanT ,
  HanT_Vert , Hangul , Hangul_Vert , Hebrew ,
  Japanese , Japanese_Vert , Kannada , Khmer ,
  Lao , Latin , Malayalam , Myanmar ,
  Oriya , Sinhala , Syriac , Tamil ,
  Telugu , Thaana , Thai , Tibetan ,
  Vietnamese }

  Fast integer versions of trained models. These are models for a single script supporting one or more languages.
- enum Best {
  Afr , Amh , Ara , Asm ,
  Aze , Aze_Cyrl , Bel , Ben ,
  Bod , Bos , Bre , Bul ,
  Cat , Ceb , Ces , Chi_Sim ,
  Chi_Sim_Vert , Chi_Tra , Chi_Tra_Vert , Chr ,
  Cos , Cym , Dan , Deu ,
  Div , Dzo , Ell , Eng ,
  Enm , Epo , Est , Eus ,
  Fao , Fas , Fil , Fin ,
  Fra , Frk , Frm , Fry ,
  Gla , Gle , Glg , Grc ,
  Guj , Hat , Heb , Hin ,
  Hrv , Hun , Hye , Iku ,
  Ind , Isl , Ita , Ita_Old ,
  Jav , Jpn , Jpn_Vert , Kan ,
  Kat , Kat_Old , Kaz , Khm ,
  Kir , Kmr , Kor , Kor_Vert ,
  Lao , Lat , Lav , Lit ,
  Ltz , Mal , Mar , Mkd ,
  Mlt , Mon , Mri , Msa ,
  Mya , Nep , Nld , Nor ,
  Oci , Ori , Osd , Pan ,
  Pol , Por , Pus , Que ,
  Ron , Rus , San , Sin ,
  Slk , Slv , Snd , Spa ,
  Spa_Old , Sqi , Srp , Srp_Latn ,
  Sun , Swa , Swe , Syr ,
  Tam , Tat , Tel , Tgk ,
  Tha , Tir , Ton , Tur ,
  Uig , Ukr , Urd , Uzb ,
  Uzb_Cyrl , Vie , Yid , Yor }

  Best (most accurate) trained models. These are models for a single language.
- enum BestScripts {
  Arabic , Armenian , Bengali , Canadian_Aboriginal ,
  Cherokee , Cyrillic , Devanagari , Ethiopic ,
  Fraktur , Georgian , Greek , Gujarati ,
  Gurmukhi , HanS , HanS_Vert , HanT ,
  HanT_Vert , Hangul , Hangul_Vert , Hebrew ,
  Japanese , Japanese_Vert , Kannada , Khmer ,
  Lao , Latin , Malayalam , Myanmar ,
  Oriya , Sinhala , Syriac , Tamil ,
  Telugu , Thaana , Thai , Tibetan ,
  Vietnamese }

  Best (most accurate) trained models. These are models for a single script supporting one or more languages.

Public Member Functions

- TesseractLanguage (string prefix, string language)

  Create a new TesseractLanguage object using the provided prefix and language name, without processing them in any way.
- TesseractLanguage (string fileName)

  Create a new TesseractLanguage object using the specified trained model data file.
- TesseractLanguage (Fast language, bool useAnyCached=false)

  Create a new TesseractLanguage object using a fast integer version of a trained model for the specified language. The language file is downloaded from the `tesseract-ocr/tessdata_fast` GitHub repository. If it has already been downloaded and cached before, the downloaded file is re-used.
- TesseractLanguage (Best language, bool useAnyCached=false)

  Create a new TesseractLanguage object using the best (most accurate) version of the trained model for the specified language. The language file is downloaded from the `tesseract-ocr/tessdata_best` GitHub repository. If it has already been downloaded and cached before, the downloaded file is re-used.
- TesseractLanguage (FastScripts script, bool useAnyCached=false)

  Create a new TesseractLanguage object using a fast integer version of a trained model for the specified script. The language file is downloaded from the `tesseract-ocr/tessdata_fast` GitHub repository. If it has already been downloaded and cached before, the downloaded file is re-used.
- TesseractLanguage (BestScripts script, bool useAnyCached=false)

  Create a new TesseractLanguage object using the best (most accurate) version of the trained model for the specified script. The language file is downloaded from the `tesseract-ocr/tessdata_best` GitHub repository. If it has already been downloaded and cached before, the downloaded file is re-used.

Properties

- string Prefix `[get]`

  The name of the folder where the language file is located.
- string Language `[get]`

  The name of the language. The Tesseract library will assume that the trained language data file can be found at `Prefix/Language.traineddata`.

7.29.1 Detailed Description

Represents a language used by Tesseract OCR.

Definition at line 13 of file TesseractLanguage.cs.

7.29.2 Member Enumeration Documentation

7.29.2.1 Best

`enum MuPDFCore.TesseractLanguage.Best`

Best (most accurate) trained models. These are models for a single language.

Enumerator

Afr	The Afrikaans language.
Amh	The Amharic language.
Ara	The Arabic language.
Asm	The Assamese language.
Aze	The Azerbaijani language.
Aze_Cyrl	The Azerbaijani language (Cyrillic).
Bel	The Belarusian language.
Ben	The Bengali language.
Bod	The Tibetan language.
Bos	The Bosnian language.
Bre	The Breton language.
Bul	The Bulgarian language.
Cat	The Catalan/Valencian language.
Ceb	The Cebuano language.
Ces	The Czech language.
Chi_Sim	The Chinese (Simplified) language.
Chi_Sim_Vert	The Chinese (Simplified) language (vertical).
Chi_Tra	The Chinese (Traditional) language.
Chi_Tra_Vert	The Chinese (Traditional) language (vertical).
Chr	The Cherokee language.
Cos	The Corsican language.
Cym	The Welsh language.
Dan	The Danish language.
Deu	The German language.
Div	The Divehi/Dhivehi/Maldivian language.
Dzo	The Dzongkha language.
Ell	The Greek, Modern (1453-) language.
Eng	The English language.
Enm	The English, Middle (1100-1500) language.
Epo	The Esperanto language.
Est	The Estonian language.
Eus	The Basque language.
Fao	The Faroese language.
Fas	The Persian language.
Fil	The Filipino/Pilipino language.
Fin	The Finnish language.
Fra	The French language.
Frk	The German - Fraktur language.
Frm	The French, Middle (ca.1400-1600) language.
Fry	The Western Frisian language.
Gla	The Gaelic/Scottish Gaelic language.
Gle	The Irish language.
Glg	The Galician language.
Grc	The Greek, Ancient (to 1453) language.
Guj	The Gujarati language.
Hat	The Haitian/Haitian Creole language.

Enumerator

Heb	The Hebrew language.
Hin	The Hindi language.
Hrv	The Croatian language.
Hun	The Hungarian language.
Hye	The Armenian language.
Iku	The Inuktitut language.
Ind	The Indonesian language.
Isl	The Icelandic language.
Ita	The Italian language.
Ita_Old	The Italian language (old).
Jav	The Javanese language.
Jpn	The Japanese language.
Jpn_Vert	The Japanese language (vertical).
Kan	The Kannada language.
Kat	The Georgian language.
Kat_Old	The Georgian language (old).
Kaz	The Kazakh language.
Khm	The Central Khmer language.
Kir	The Kirghiz/Kyrgyz language.
Kmr	The Northern Kurdish language.
Kor	The Korean language.
Kor_Vert	The Korean language (vertical).
Lao	The Lao language.
Lat	The Latin language.
Lav	The Latvian language.
Lit	The Lithuanian language.
Ltz	The Luxembourgish/Letzeburgesch language.
Mal	The Malayalam language.
Mar	The Marathi language.
Mkd	The Macedonian language.
Mlt	The Maltese language.
Mon	The Mongolian language.
Mri	The Maori language.
Msa	The Malay language.
Mya	The Burmese language.
Nep	The Nepali language.
Nld	The Dutch/Flemish language.
Nor	The Norwegian language.
Oci	The Occitan (post 1500) language.
Ori	The Oriya language.
Osd	The Orientation and script detection module.
Pan	The Panjabi/Punjabi language.
Pol	The Polish language.
Por	The Portuguese language.
Pus	The Pushto/Pashto language.
Que	The Quechua language.

Enumerator

Ron	The Romanian/Moldavian/Moldovan language.
Rus	The Russian language.
San	The Sanskrit language.
Sin	The Sinhala/Sinhalese language.
Slk	The Slovak language.
Slv	The Slovenian language.
Snd	The Sindhi language.
Spa	The Spanish/Castilian language.
Spa_Old	The Spanish/Castilian language (old).
Sqi	The Albanian language.
Srp	The Serbian language.
Srp_Latn	The Serbian language (Latin).
Sun	The Sundanese language.
Swa	The Swahili language.
Swe	The Swedish language.
Syr	The Syriac language.
Tam	The Tamil language.
Tat	The Tatar language.
Tel	The Telugu language.
Tgk	The Tajik language.
Tha	The Thai language.
Tir	The Tigrinya language.
Ton	The Tonga (Tonga Islands) language.
Tur	The Turkish language.
Uig	The Uighur/Uyghur language.
Ukr	The Ukrainian language.
Urd	The Urdu language.
Uzb	The Uzbek language.
Uzb_Cyrl	The Uzbek language (Cyrillic).
Vie	The Vietnamese language.
Yid	The Yiddish language.
Yor	The Yoruba language.

Definition at line 690 of file TesseractLanguage.cs.

7.29.2.2 BestScripts

`enum MuPDFCore.TesseractLanguage.BestScripts`

Best (most accurate) trained models. These are models for a single script supporting one or more languages.

Enumerator

Arabic	The Arabic script.
Armenian	The Armenian script.

Enumerator

Bengali	The Bengali script.
Canadian_Aboriginal	The Canadian Aboriginal script.
Cherokee	The Cherokee script.
Cyrillic	The Cyrillic script.
Devanagari	The Devanagari script.
Ethiopic	The Ethiopic script.
Fraktur	The Fraktur script.
Georgian	The Georgian script.
Greek	The Greek script.
Gujarati	The Gujarati script.
Gurmukhi	The Gurmukhi script.
HanS	The Han (Simplified) script.
HanS_Vert	The Han (Simplified) script. (vertical)
HanT	The Han (Traditional) script.
HanT_Vert	The Han (Traditional) script. (vertical)
Hangul	The Hangul script.
Hangul_Vert	The Hangul script. (vertical)
Hebrew	The Hebrew script.
Japanese	The Japanese script.
Japanese_Vert	The Japanese script. (vertical)
Kannada	The Kannada script.
Khmer	The Khmer script.
Lao	The Lao script.
Latin	The Latin script.
Malayalam	The Malayalam script.
Myanmar	The Myanmar script.
Oriya	The Oriya script.
Sinhala	The Sinhala script.
Syriac	The Syriac script.
Tamil	The Tamil script.
Telugu	The Telugu script.
Thaana	The Thaana script.
Thai	The Thai script.
Tibetan	The Tibetan script.
Vietnamese	The Vietnamese script.

Definition at line 1193 of file TesseractLanguage.cs.

7.29.2.3 Fast

`enum MuPDFCore.TesseractLanguage.Fast`

Fast integer versions of trained models. These are models for a single language.

Enumerator

Afr	The Afrikaans language.
Amh	The Amharic language.
Ara	The Arabic language.
Asm	The Assamese language.
Aze	The Azerbaijani language.
Aze_Cyrl	The Azerbaijani language (Cyrillic).
Bel	The Belarusian language.
Ben	The Bengali language.
Bod	The Tibetan language.
Bos	The Bosnian language.
Bre	The Breton language.
Bul	The Bulgarian language.
Cat	The Catalan/Valencian language.
Ceb	The Cebuano language.
Ces	The Czech language.
Chi_Sim	The Chinese (Simplified) language.
Chi_Sim_Vert	The Chinese (Simplified) language (vertical).
Chi_Tra	The Chinese (Traditional) language.
Chi_Tra_Vert	The Chinese (Traditional) language (vertical).
Chr	The Cherokee language.
Cos	The Corsican language.
Cym	The Welsh language.
Dan	The Danish language.
Deu	The German language.
Div	The Divehi/Dhivehi/Maldivian language.
Dzo	The Dzongkha language.
Ell	The Greek, Modern (1453-) language.
Eng	The English language.
Enm	The English, Middle (1100-1500) language.
Epo	The Esperanto language.
Equ	A language for equations.
Est	The Estonian language.
Eus	The Basque language.
Fao	The Faroese language.
Fas	The Persian language.
Fil	The Filipino/Pilipino language.
Fin	The Finnish language.
Fra	The French language.
Frk	The German - Fraktur language.
Frm	The French, Middle (ca.1400-1600) language.
Fry	The Western Frisian language.
Gla	The Gaelic/Scottish Gaelic language.
Gle	The Irish language.
Glg	The Galician language.
Grc	The Greek, Ancient (to 1453) language.
Guj	The Gujarati language.

Enumerator

Hat	The Haitian/Haitian Creole language.
Heb	The Hebrew language.
Hin	The Hindi language.
Hrv	The Croatian language.
Hun	The Hungarian language.
Hye	The Armenian language.
Iku	The Inuktitut language.
Ind	The Indonesian language.
Isl	The Icelandic language.
Ita	The Italian language.
Ita_Old	The Italian language (old).
Jav	The Javanese language.
Jpn	The Japanese language.
Jpn_Vert	The Japanese language (vertical).
Kan	The Kannada language.
Kat	The Georgian language.
Kat_Old	The Georgian language (old).
Kaz	The Kazakh language.
Khm	The Central Khmer language.
Kir	The Kirghiz/Kyrgyz language.
Kmr	The Northern Kurdish language.
Kor	The Korean language.
Kor_Vert	The Korean language (vertical).
Lao	The Lao language.
Lat	The Latin language.
Lav	The Latvian language.
Lit	The Lithuanian language.
Ltz	The Luxembourgish/Letzeburgesch language.
Mal	The Malayalam language.
Mar	The Marathi language.
Mkd	The Macedonian language.
Mlt	The Maltese language.
Mon	The Mongolian language.
Mri	The Maori language.
Msa	The Malay language.
Mya	The Burmese language.
Nep	The Nepali language.
Nld	The Dutch/Flemish language.
Nor	The Norwegian language.
Oci	The Occitan (post 1500) language.
Ori	The Oriya language.
Osd	The Orientation and script detection module.
Pan	The Panjabi/Punjabi language.
Pol	The Polish language.
Por	The Portuguese language.
Pus	The Pushto/Pashto language.

Enumerator

Que	The Quechua language.
Ron	The Romanian/Moldavian/Moldovan language.
Rus	The Russian language.
San	The Sanskrit language.
Sin	The Sinhala/Sinhalese language.
Slk	The Slovak language.
Slv	The Slovenian language.
Snd	The Sindhi language.
Spa	The Spanish/Castilian language.
Spa_Old	The Spanish/Castilian language (old).
Sqi	The Albanian language.
Srp	The Serbian language.
Srp_Latn	The Serbian language (Latin).
Sun	The Sundanese language.
Swa	The Swahili language.
Swe	The Swedish language.
Syr	The Syriac language.
Tam	The Tamil language.
Tat	The Tatar language.
Tel	The Telugu language.
Tgk	The Tajik language.
Tha	The Thai language.
Tir	The Tigrinya language.
Ton	The Tonga (Tonga Islands) language.
Tur	The Turkish language.
Uig	The Uighur/Uyghur language.
Ukr	The Ukrainian language.
Urd	The Urdu language.
Uzb	The Uzbek language.
Uzb_Cyrl	The Uzbek language (Cyrillic).
Vie	The Vietnamese language.
Yid	The Yiddish language.
Yor	The Yoruba language.

Definition at line 28 of file TesseractLanguage.cs.

7.29.2.4 FastScripts

`enum MuPDFCore.TesseractLanguage.FastScripts`

Fast integer versions of trained models. These are models for a single script supporting one or more languages.

Enumerator

Arabic	The Arabic script.

Enumerator

Armenian	The Armenian script.
Bengali	The Bengali script.
Canadian_Aboriginal	The Canadian Aboriginal script.
Cherokee	The Cherokee script.
Cyrillic	The Cyrillic script.
Devanagari	The Devanagari script.
Ethiopic	The Ethiopic script.
Fraktur	The Fraktur script.
Georgian	The Georgian script.
Greek	The Greek script.
Gujarati	The Gujarati script.
Gurmukhi	The Gurmukhi script.
HanS	The Han (Simplified) script.
HanS_Vert	The Han (Simplified) script. (vertical)
HanT	The Han (Traditional) script.
HanT_Vert	The Han (Traditional) script. (vertical)
Hangul	The Hangul script.
Hangul_Vert	The Hangul script. (vertical)
Hebrew	The Hebrew script.
Japanese	The Japanese script.
Japanese_Vert	The Japanese script. (vertical)
Kannada	The Kannada script.
Khmer	The Khmer script.
Lao	The Lao script.
Latin	The Latin script.
Malayalam	The Malayalam script.
Myanmar	The Myanmar script.
Oriya	The Oriya script.
Sinhala	The Sinhala script.
Syriac	The Syriac script.
Tamil	The Tamil script.
Telugu	The Telugu script.
Thaana	The Thaana script.
Thai	The Thai script.
Tibetan	The Tibetan script.
Vietnamese	The Vietnamese script.

Definition at line 535 of file TesseractLanguage.cs.

7.29.3 Constructor & Destructor Documentation

7.29.3.1 TesseractLanguage() [1/6]

```
MuPDFCore.TesseractLanguage.TesseractLanguage (
            string prefix,
            string language )
```

Create a new TesseractLanguage object using the provided *prefix* and *language* name, without processing them in any way.

Parameters

prefix	The name of the folder where the language file is located. If this is `null`, the value of the environment variable `TESSDATA_PREFIX` will be used.
language	The name of the language. The Tesseract library will assume that the trained language data file can be found at *prefix* / *language* `.traineddata`.

Definition at line 1350 of file TesseractLanguage.cs.

7.29.3.2 TesseractLanguage() [2/6]

```
MuPDFCore.TesseractLanguage.TesseractLanguage (
            string fileName )
```

Create a new TesseractLanguage object using the specified trained model data file.

Parameters

fileName	The path to the trained model data file. If the file name does not end in `.traineddata`, the file is copied to a temporary folder, and the temporary file is used by the Tesseract library.

Definition at line 1360 of file TesseractLanguage.cs.

7.29.3.3 TesseractLanguage() [3/6]

```
MuPDFCore.TesseractLanguage.TesseractLanguage (
            Fast language,
            bool useAnyCached = false )
```

Create a new TesseractLanguage object using a fast integer version of a trained model for the specified language. The language file is downloaded from the `tesseract-ocr/tessdata_fast` GitHub repository. If it has already been downloaded and cached before, the downloaded file is re-used.

Parameters

language	The language to use for the OCR process.
useAnyCached	If this is `true`, if a cached trained model file is available for the specified language, it will be used even if it is a "best (most accurate)" model. Otherwise, only cached fast integer trained models will be used.

Definition at line 1387 of file TesseractLanguage.cs.

7.29.3.4 TesseractLanguage() [4/6]

```
MuPDFCore.TesseractLanguage.TesseractLanguage (
            Best language,
            bool useAnyCached = false )
```

Create a new TesseractLanguage object using the best (most accurate) version of the trained model for the specified language. The language file is downloaded from the `tesseract-ocr/tessdata_best` GitHub repository. If it has already been downloaded and cached before, the downloaded file is re-used.

Parameters

language	The language to use for the OCR process.
useAnyCached	If this is `true`, if a cached trained model file is available for the specified language, it will be used even if it is a "fast" model. Otherwise, only cached best (most accurate) trained models will be used.

Definition at line 1453 of file TesseractLanguage.cs.

7.29.3.5 TesseractLanguage() [5/6]

```
MuPDFCore.TesseractLanguage.TesseractLanguage (
            FastScripts script,
            bool useAnyCached = false )
```

Create a new TesseractLanguage object using a fast integer version of a trained model for the specified script. The language file is downloaded from the `tesseract-ocr/tessdata_fast` GitHub repository. If it has already been downloaded and cached before, the downloaded file is re-used.

Parameters

script	The script to use for the OCR process.
useAnyCached	If this is `true`, if a cached trained model file is available for the specified script, it will be used even if it is a "best (most accurate)" model. Otherwise, only cached fast integer trained models will be used.

Definition at line 1519 of file TesseractLanguage.cs.

7.29.3.6 TesseractLanguage() [6/6]

```
MuPDFCore.TesseractLanguage.TesseractLanguage (
            BestScripts script,
            bool useAnyCached = false )
```

Create a new TesseractLanguage object using the best (most accurate) version of the trained model for the specified script. The language file is downloaded from the `tesseract-ocr/tessdata_best` GitHub repository. If it has already been downloaded and cached before, the downloaded file is re-used.

Parameters

script	The script to use for the OCR process.
useAnyCached	If this is `true`, if a cached trained model file is available for the specified script, it will be used even if it is a "fast" model. Otherwise, only cached best (most accurate) trained models will be used.

Definition at line 1589 of file TesseractLanguage.cs.

7.29.4 Property Documentation

7.29.4.1 Language

```
string MuPDFCore.TesseractLanguage.Language  [get]
```

The name of the language. The Tesseract library will assume that the trained language data file can be found at `Prefix/Language.traineddata`.

Definition at line 23 of file TesseractLanguage.cs.

7.29.4.2 Prefix

```
string MuPDFCore.TesseractLanguage.Prefix  [get]
```

The name of the folder where the language file is located.

Definition at line 18 of file TesseractLanguage.cs.

The documentation for this class was generated from the following file:

- MuPDFCore/TesseractLanguage.cs

7.30 MuPDFCore.RenderProgress.ThreadRenderProgress Struct Reference

Holds the progress of a single thread.

Public Attributes

- int Progress

  The current progress.
- long MaxProgress

  The maximum progress. If this is 0, this value could not be determined (yet).

7.30.1 Detailed Description

Holds the progress of a single thread.

Definition at line 373 of file MuPDF.cs.

7.30.2 Member Data Documentation

7.30.2.1 MaxProgress

```
long MuPDFCore.RenderProgress.ThreadRenderProgress.MaxProgress
```

The maximum progress. If this is 0, this value could not be determined (yet).

Definition at line 383 of file MuPDF.cs.

7.30.2.2 Progress

```
int MuPDFCore.RenderProgress.ThreadRenderProgress.Progress
```

The current progress.

Definition at line 378 of file MuPDF.cs.

The documentation for this struct was generated from the following file:

- MuPDFCore/MuPDF.cs

Chapter 8

File Documentation

8.1 PDFRenderer.cs

```
00001 /*
00002     MuPDFCore.MuPDFRenderer - A control to display documents in Avalonia using MuPDFCore.
00003     Copyright (C) 2020  Giorgio Bianchini
00004 
00005     This program is free software: you can redistribute it and/or modify
00006     it under the terms of the GNU Affero General Public License as
00007     published by the Free Software Foundation, version 3.
00008 
00009     This program is distributed in the hope that it will be useful,
00010     but WITHOUT ANY WARRANTY; without even the implied warranty of
00011     MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.  See the
00012     GNU Affero General Public License for more details.
00013 
00014     You should have received a copy of the GNU Affero General Public License
00015     along with this program.  If not, see <http://www.gnu.org/licenses/>
00016 */
00017 
00018 using Avalonia;
00019 using Avalonia.Animation;
00020 using Avalonia.Controls;
00021 using Avalonia.Input;
00022 using Avalonia.Layout;
00023 using Avalonia.LogicalTree;
00024 using Avalonia.Media;
00025 using Avalonia.Media.Imaging;
00026 using Avalonia.Platform;
00027 using Avalonia.Threading;
00028 using System;
00029 using System.Collections.Generic;
00030 using System.IO;
00031 using System.Linq;
00032 using System.Runtime.InteropServices;
00033 using System.Text.RegularExpressions;
00034 using System.Threading;
00035 using System.Threading.Tasks;
00036 
00037 namespace MuPDFCore.MuPDFRenderer
00038 {
00039     /// <summary>
00040     /// A control to render PDF documents (and other formats), potentally using multiple threads.
00041     /// </summary>
00042     public partial class PDFRenderer : Control
00043     {
00044         /// <summary>
00045         /// If this is true, the <see cref="Context"/> and <see cref="Document"/> will be disposed
       when this object is detached from the logical tree.
00046         /// </summary>
00047         private bool OwnsContextAndDocument = true;
00048 
00049         /// <summary>
00050         /// The <see cref="MuPDFContext"/> using which the <see cref="Document"/> was created.
00051         /// </summary>
00052         protected MuPDFContext Context;
00053 
00054         /// <summary>
00055         /// The <see cref="MuPDFDocument"/> from which the <see cref="Renderer"/> was created.
00056         /// </summary>
00057         protected MuPDFDocument Document;
```

```
00058
00059         /// <summary>
00060         /// The <see cref="MuPDFMultiThreadedPageRenderer"/> that renders the dynamic tiles.
00061         /// </summary>
00062         private MuPDFMultiThreadedPageRenderer Renderer;
00063
00064         /// <summary>
00065         /// The static renderisation of the page.
00066         /// </summary>
00067         private WriteableBitmap FixedCanvasBitmap;
00068
00069         /// <summary>
00070         /// The area covered by the <see cref="FixedCanvasBitmap"/>. It should be equal to the <see
      cref="PageSize"/>, but doesn't have to.
00071         /// </summary>
00072         private Rectangle FixedArea;
00073
00074         /// <summary>
00075         /// The position and size of the dynamic tiles.
00076         /// </summary>
00077         private RoundedRectangle[] DynamicImagesBounds;
00078
00079         /// <summary>
00080         /// The dynamic tiles.
00081         /// </summary>
00082         private WriteableBitmap[] DynamicBitmaps;
00083
00084         /// <summary>
00085         /// If this is true, the <see cref="DynamicBitmaps"/> have been rendered and can be drawn on
      screen.
00086         /// </summary>
00087         private bool AreDynamicBitmapsReady = false;
00088
00089         /// <summary>
00090         /// If this is true, the <see cref="DynamicBitmaps"/> will be rendered again immediately after
      the current rendering operation finishes.
00091         /// </summary>
00092         private bool RenderQueued = false;
00093
00094         /// <summary>
00095         /// A <see cref="Mutex"/> to synchronise rendering operations. If someone else is holding this
      mutex, you can assume that it's not safe to access the <see cref="DynamicBitmaps"/>.
00096         /// </summary>
00097         private Mutex RenderMutex;
00098
00099         /// <summary>
00100         /// A <see cref="Geometry"/> holding the icon that is displayed in the top-right corner when
      the <see cref="DynamicBitmaps"/> are not available.
00101         /// </summary>
00102         private PathGeometry RefreshingGeometry;
00103
00104         /// <summary>
00105         /// The thread that is in charge of responding to the rendering requests and either starting a
      new rendering of the <see cref="DynamicBitmaps"/>, or queueing it.
00106         /// </summary>
00107         private Thread RenderDynamicCanvasOuterThread;
00108
00109         /// <summary>
00110         /// An <see cref="EventWaitHandle"/> that signals a request for rendering to the <see
      cref="RenderDynamicCanvasOuterThread"/>.
00111         /// </summary>
00112         private readonly EventWaitHandle RenderDynamicCanvasOuterHandle = new EventWaitHandle(false,
      EventResetMode.ManualReset);
00113
00114         /// <summary>
00115         /// The thread that is in charge of rendering the <see cref="DynamicBitmaps"/>.
00116         /// </summary>
00117         private Thread RenderDynamicCanvasInnerThread;
00118
00119         /// <summary>
00120         /// An <see cref="EventWaitHandle"/> that signals a request for rendering to the <see
      cref="RenderDynamicCanvasInnerThread"/>.
00121         /// </summary>
00122         private readonly EventWaitHandle RenderDynamicCanvasInnerHandle = new EventWaitHandle(false,
      EventResetMode.ManualReset);
00123
00124         /// <summary>
00125         /// An <see cref="EventWaitHandle"/> that signals to the <see
      cref="RenderDynamicCanvasOuterThread"/> that the <see cref="RenderDynamicCanvasInnerThread"/> has
      acquired the <see cref="RenderMutex"/> and is starting rendering.
00126         /// </summary>
00127         private readonly EventWaitHandle RenderDynamicCanvasInnerStartedHandle = new
      EventWaitHandle(false, EventResetMode.ManualReset);
00128
00129         /// <summary>
00130         /// An <see cref="EventWaitHandle"/> that signals to the <see
      cref="RenderDynamicCanvasOuterThread"/> and the <see cref="RenderDynamicCanvasInnerThread"/> to cease
```

```
      all operation because this <see cref="PDFRenderer"/> is being detached from the logical tree.
00131         /// </summary>
00132         private readonly EventWaitHandle RendererDisposedHandle = new EventWaitHandle(false,
      EventResetMode.ManualReset);
00133
00134         /// <summary>
00135         /// The current rendering resolution (in screen units) that is used by the renderer when
      rendering the <see cref="DynamicBitmaps"/>.
00136         /// </summary>
00137         private readonly int[] RenderSize = new int[2];
00138
00139         /// <summary>
00140         /// The area on the page that will be rendered by the renderer in the <see
      cref="DynamicBitmaps"/>.
00141         /// </summary>
00142         private Rect RenderDisplayArea;
00143
00144         /// <summary>
00145         /// A lock to prevent race conditions when multiple rendering passes are queued consecutively.
00146         /// </summary>
00147         private readonly object RenderDisplayAreaLock = new object();
00148
00149         /// <summary>
00150         /// Whether a PointerPressed event has fired.
00151         /// </summary>
00152         private bool IsMouseDown = false;
00153
00154         /// <summary>
00155         /// The point at which the PointerPressed event fired.
00156         /// </summary>
00157         private Point MouseDownPoint;
00158
00159         /// <summary>
00160         /// The <see cref="DisplayArea"/> when the PointerPressed event fired.
00161         /// </summary>
00162         private Rect MouseDownDisplayArea;
00163
00164         /// <summary>
00165         /// A structured text representation of the current page, used for selection and search
      highlight.
00166         /// </summary>
00167         protected MuPDFStructuredTextPage StructuredTextPage;
00168
00169         /// <summary>
00170         /// A list of <see cref="Quad"/>s that cover the selected text region.
00171         /// </summary>
00172         protected List<Quad> SelectionQuads;
00173
00174         /// <summary>
00175         /// A list of <see cref="Quad"/>s that cover the highlighted regions.
00176         /// </summary>
00177         protected List<Quad> HighlightQuads;
00178
00179         /// <summary>
00180         /// Defines the current mouse operation.
00181         /// </summary>
00182         private enum CurrentMouseOperations
00183         {
00184             /// <summary>
00185             /// The mouse is being used to pan around the page.
00186             /// </summary>
00187             Pan,
00188
00189             /// <summary>
00190             /// The mouse is being used to highlight text
00191             /// </summary>
00192             Highlight
00193         }
00194
00195         /// <summary>
00196         /// The current mouse operation.
00197         /// </summary>
00198         private CurrentMouseOperations CurrentMouseOperation;
00199
00200         /// <summary>
00201         /// Initializes a new instance of the <see cref="PDFRenderer"/> class.
00202         /// </summary>
00203         public PDFRenderer()
00204         {
00205             this.InitializeComponent();
00206
00207             this.PropertyChanged += ControlPropertyChanged;
00208             this.DetachedFromLogicalTree += ControlDetachedFromLogicalTree;
00209             this.PointerPressed += ControlPointerPressed;
00210             this.PointerReleased += ControlPointerReleased;
00211             this.PointerMoved += ControlPointerMoved;
00212             this.PointerWheelChanged += ControlPointerWheelChanged;
```

```
00213         }
00214
00215         /// <summary>
00216         /// Initializes inner components of the <see cref="PDFRenderer"/>.
00217         /// </summary>
00218         private void InitializeComponent()
00219         {
00220             PathFigure arrow1 = new PathFigure
00221             {
00222                 StartPoint = new Point(16 * Math.Cos(Math.PI / 4), 16 * Math.Sin(Math.PI / 4))
00223             };
00224             arrow1.Segments.Add(new ArcSegment() { Point = new Point(-16, 0), IsLargeArc = false,
      RotationAngle = 0, Size = new Avalonia.Size(16, 16), SweepDirection = SweepDirection.Clockwise });
00225             arrow1.Segments.Add(new LineSegment() { Point = new Point(-7.2727, 0) });
00226             arrow1.Segments.Add(new LineSegment() { Point = new Point(-21.8181, -17.4545) });
00227             arrow1.Segments.Add(new LineSegment() { Point = new Point(-36.3636, 0) });
00228             arrow1.Segments.Add(new LineSegment() { Point = new Point(-27.6363, 0) });
00229             arrow1.Segments.Add(new ArcSegment() { Point = new Point(27.6363 * Math.Cos(Math.PI / 4),
      27.6363 * Math.Sin(Math.PI / 4)), IsLargeArc = false, RotationAngle = 0, Size = new
      Avalonia.Size(27.6363, 27.6363), SweepDirection = SweepDirection.CounterClockwise });
00230             arrow1.IsClosed = true;
00231
00232             PathFigure arrow2 = new PathFigure
00233             {
00234                 StartPoint = new Point(16 * Math.Cos(5 * Math.PI / 4), 16 * Math.Sin(5 * Math.PI / 4))
00235             };
00236             arrow2.Segments.Add(new ArcSegment() { Point = new Point(16, 0), IsLargeArc = false,
      RotationAngle = 0, Size = new Avalonia.Size(16, 16), SweepDirection = SweepDirection.Clockwise });
00237             arrow2.Segments.Add(new LineSegment() { Point = new Point(7.2727, 0) });
00238             arrow2.Segments.Add(new LineSegment() { Point = new Point(21.8181, 17.4545) });
00239             arrow2.Segments.Add(new LineSegment() { Point = new Point(36.3636, 0) });
00240             arrow2.Segments.Add(new LineSegment() { Point = new Point(27.6363, 0) });
00241             arrow2.Segments.Add(new ArcSegment() { Point = new Point(27.6363 * Math.Cos(5 * Math.PI /
      4), 27.6363 * Math.Sin(5 * Math.PI / 4)), IsLargeArc = false, RotationAngle = 0, Size = new
      Avalonia.Size(27.6363, 27.6363), SweepDirection = SweepDirection.CounterClockwise });
00242             arrow2.IsClosed = true;
00243
00244             RefreshingGeometry = new PathGeometry();
00245             RefreshingGeometry.Figures.Add(arrow1);
00246             RefreshingGeometry.Figures.Add(arrow2);
00247         }
00248
00249         /// <summary>
00250         /// Set up the <see cref="PDFRenderer"/> to display a page of a <see cref="MuPDFDocument"/>.
00251         /// </summary>
00252         /// <param name="document">The <see cref="MuPDFDocument"/> to render.</param>
00253         /// <param name="threadCount">The number of threads to use in the rendering. If this is 0, an
      appropriate number of threads based on the number of processors in the computer will be used.
      Otherwise, this must be factorisable using only powers of 2, 3, 5 or 7. If this is not the case, the
      biggest number smaller than <paramref name="threadCount"/> that satisfies this condition is
      used.</param>
00254         /// <param name="pageNumber">The index of the page that should be rendered. The first page has
      index 0.</param>
00255         /// <param name="resolutionMultiplier">This value can be used to increase or decrease the
      resolution at which the static renderisation of the page will be produced. If <paramref
      name="resolutionMultiplier"/> is 1, the resolution will match the size (in screen units) of the <see
      cref="PDFRenderer"/>.</param>
00256         /// <param name="includeAnnotations">If this is <see langword="true" />, annotations (e.g.
      signatures) are included in the rendering. Otherwise, only the page contents are included.</param>
00257         /// <param name="ocrLanguage">The language to use for optical character recognition (OCR). If
      this is null, no OCR is performed.</param>
00258         public void Initialize(MuPDFDocument document, int threadCount = 0, int pageNumber = 0, double
      resolutionMultiplier = 1, bool includeAnnotations = true, TesseractLanguage ocrLanguage = null)
00259         {
00260             if (IsViewerInitialized)
00261             {
00262                 ReleaseResources();
00263             }
00264
00265             OwnsContextAndDocument = false;
00266
00267             Document = document;
00268             Context = null;
00269
00270             ContinueInitialization(threadCount, pageNumber, resolutionMultiplier, includeAnnotations,
      ocrLanguage);
00271         }
00272
00273         /// <summary>
00274         /// Set up the <see cref="PDFRenderer"/> to display a page of a <see cref="MuPDFDocument"/>.
      The OCR step is run asynchronously, in order not to block the UI thread.
00275         /// </summary>
00276         /// <param name="document">The <see cref="MuPDFDocument"/> to render.</param>
00277         /// <param name="threadCount">The number of threads to use in the rendering. If this is 0, an
      appropriate number of threads based on the number of processors in the computer will be used.
      Otherwise, this must be factorisable using only powers of 2, 3, 5 or 7. If this is not the case, the
      biggest number smaller than <paramref name="threadCount"/> that satisfies this condition is
```

```
used.</param>
00278         /// <param name="pageNumber">The index of the page that should be rendered. The first page has
index 0.</param>
00279         /// <param name="resolutionMultiplier">This value can be used to increase or decrease the
resolution at which the static renderisation of the page will be produced. If <paramref
name="resolutionMultiplier"/> is 1, the resolution will match the size (in screen units) of the <see
cref="PDFRenderer"/>.</param>
00280         /// <param name="includeAnnotations">If this is <see langword="true" />, annotations (e.g.
signatures) are included in the rendering. Otherwise, only the page contents are included.</param>
00281         /// <param name="ocrLanguage">The language to use for optical character recognition (OCR). If
this is null, no OCR is performed.</param>
00282         /// <param name="ocrCancellationToken">A <see cref="CancellationToken"/> used to cancel the
OCR operation.</param>
00283         /// <param name="ocrProgress">An <see cref="IProgress{OCRProgressInfo}"/> used to report OCR
progress.</param>
00284         public async Task InitializeAsync(MuPDFDocument document, int threadCount = 0, int pageNumber
= 0, double resolutionMultiplier = 1, bool includeAnnotations = true, TesseractLanguage ocrLanguage =
null, CancellationToken ocrCancellationToken = default, IProgress<OCRProgressInfo> ocrProgress =
null)
00285         {
00286             if (IsViewerInitialized)
00287             {
00288                 ReleaseResources();
00289             }
00290
00291             OwnsContextAndDocument = false;
00292
00293             Document = document;
00294             Context = null;
00295
00296             await ContinueInitializationAsync(threadCount, pageNumber, resolutionMultiplier,
includeAnnotations, ocrLanguage, ocrCancellationToken, ocrProgress);
00297         }
00298
00299         /// <summary>
00300         /// Set up the <see cref="PDFRenderer"/> to display a page of a document that will be loaded
from disk.
00301         /// </summary>
00302         /// <param name="fileName">The path to the document that should be opened.</param>
00303         /// <param name="threadCount">The number of threads to use in the rendering. If this is 0, an
appropriate number of threads based on the number of processors in the computer will be used.
Otherwise, this must be factorisable using only powers of 2, 3, 5 or 7. If this is not the case, the
biggest number smaller than <paramref name="threadCount"/> that satisfies this condition is
used.</param>
00304         /// <param name="pageNumber">The index of the page that should be rendered. The first page has
index 0.</param>
00305         /// <param name="resolutionMultiplier">This value can be used to increase or decrease the
resolution at which the static renderisation of the page will be produced. If <paramref
name="resolutionMultiplier"/> is 1, the resolution will match the size (in screen units) of the <see
cref="PDFRenderer"/>.</param>
00306         /// <param name="includeAnnotations">If this is <see langword="true" />, annotations (e.g.
signatures) are included in the rendering. Otherwise, only the page contents are included.</param>
00307         /// <param name="ocrLanguage">The language to use for optical character recognition (OCR). If
this is null, no OCR is performed.</param>
00308         public void Initialize(string fileName, int threadCount = 0, int pageNumber = 0, double
resolutionMultiplier = 1, bool includeAnnotations = true, TesseractLanguage ocrLanguage = null)
00309         {
00310             if (IsViewerInitialized)
00311             {
00312                 ReleaseResources();
00313             }
00314
00315             OwnsContextAndDocument = true;
00316
00317             Context = new MuPDFContext();
00318             Document = new MuPDFDocument(Context, fileName);
00319
00320             ContinueInitialization(threadCount, pageNumber, resolutionMultiplier, includeAnnotations,
ocrLanguage);
00321         }
00322
00323         /// <summary>
00324         /// Set up the <see cref="PDFRenderer"/> to display a page of a document that will be loaded
from disk. The OCR step is run asynchronously, in order not to block the UI thread.
00325         /// </summary>
00326         /// <param name="fileName">The path to the document that should be opened.</param>
00327         /// <param name="threadCount">The number of threads to use in the rendering. If this is 0, an
appropriate number of threads based on the number of processors in the computer will be used.
Otherwise, this must be factorisable using only powers of 2, 3, 5 or 7. If this is not the case, the
biggest number smaller than <paramref name="threadCount"/> that satisfies this condition is
used.</param>
00328         /// <param name="pageNumber">The index of the page that should be rendered. The first page has
index 0.</param>
00329         /// <param name="resolutionMultiplier">This value can be used to increase or decrease the
resolution at which the static renderisation of the page will be produced. If <paramref
name="resolutionMultiplier"/> is 1, the resolution will match the size (in screen units) of the <see
cref="PDFRenderer"/>.</param>
```

```
00330         /// <param name="includeAnnotations">If this is <see langword="true" />, annotations (e.g.
      signatures) are included in the rendering. Otherwise, only the page contents are included.</param>
00331         /// <param name="ocrLanguage">The language to use for optical character recognition (OCR). If
      this is null, no OCR is performed.</param>
00332         /// <param name="ocrCancellationToken">A <see cref="CancellationToken"/> used to cancel the
      OCR operation.</param>
00333         /// <param name="ocrProgress">An <see cref="IProgress{OCRProgressInfo}"/> used to report OCR
      progress.</param>
00334         public async Task InitializeAsync(string fileName, int threadCount = 0, int pageNumber = 0,
      double resolutionMultiplier = 1, bool includeAnnotations = true, TesseractLanguage ocrLanguage =
      null, CancellationToken ocrCancellationToken = default, IProgress<OCRProgressInfo> ocrProgress =
      null)
00335         {
00336             if (IsViewerInitialized)
00337             {
00338                 ReleaseResources();
00339             }
00340 
00341             OwnsContextAndDocument = true;
00342 
00343             Context = new MuPDFContext();
00344             Document = new MuPDFDocument(Context, fileName);
00345 
00346             await ContinueInitializationAsync(threadCount, pageNumber, resolutionMultiplier,
      includeAnnotations, ocrLanguage, ocrCancellationToken, ocrProgress);
00347         }
00348 
00349         /// <summary>
00350         /// Set up the <see cref="PDFRenderer"/> to display a page of a document that will be loaded
      from a <see cref="MemoryStream"/>.
00351         /// </summary>
00352         /// <param name="ms">The <see cref="MemoryStream"/> containing the document that should be
      opened. This can be safely disposed after this method returns.</param>
00353         /// <param name="fileType">The format of the document.</param>
00354         /// <param name="threadCount">The number of threads to use in the rendering. If this is 0, an
      appropriate number of threads based on the number of processors in the computer will be used.
      Otherwise, this must be factorisable using only powers of 2, 3, 5 or 7. If this is not the case, the
      biggest number smaller than <paramref name="threadCount"/> that satisfies this condition is
      used.</param>
00355         /// <param name="pageNumber">The index of the page that should be rendered. The first page has
      index 0.</param>
00356         /// <param name="resolutionMultiplier">This value can be used to increase or decrease the
      resolution at which the static renderisation of the page will be produced. If <paramref
      name="resolutionMultiplier"/> is 1, the resolution will match the size (in screen units) of the <see
      cref="PDFRenderer"/>.</param>
00357         /// <param name="includeAnnotations">If this is <see langword="true" />, annotations (e.g.
      signatures) are included in the rendering. Otherwise, only the page contents are included.</param>
00358         /// <param name="ocrLanguage">The language to use for optical character recognition (OCR). If
      this is null, no OCR is performed.</param>
00359         public void Initialize(MemoryStream ms, InputFileTypes fileType, int threadCount = 0, int
      pageNumber = 0, double resolutionMultiplier = 1, bool includeAnnotations = true, TesseractLanguage
      ocrLanguage = null)
00360         {
00361             //Get the byte array that underlies the MemoryStream.
00362             int origin = (int)ms.Seek(0, SeekOrigin.Begin);
00363             long dataLength = ms.Length;
00364             byte[] dataBytes = ms.GetBuffer();
00365 
00366             Initialize(dataBytes, fileType, origin, (int)dataLength, threadCount, pageNumber,
      resolutionMultiplier, includeAnnotations, ocrLanguage);
00367         }
00368 
00369         /// <summary>
00370         /// Set up the <see cref="PDFRenderer"/> to display a page of a document that will be loaded
      from a <see cref="MemoryStream"/>. The OCR step is run asynchronously, in order not to block the UI
      thread.
00371         /// </summary>
00372         /// <param name="ms">The <see cref="MemoryStream"/> containing the document that should be
      opened. This can be safely disposed after this method returns.</param>
00373         /// <param name="fileType">The format of the document.</param>
00374         /// <param name="threadCount">The number of threads to use in the rendering. If this is 0, an
      appropriate number of threads based on the number of processors in the computer will be used.
      Otherwise, this must be factorisable using only powers of 2, 3, 5 or 7. If this is not the case, the
      biggest number smaller than <paramref name="threadCount"/> that satisfies this condition is
      used.</param>
00375         /// <param name="pageNumber">The index of the page that should be rendered. The first page has
      index 0.</param>
00376         /// <param name="resolutionMultiplier">This value can be used to increase or decrease the
      resolution at which the static renderisation of the page will be produced. If <paramref
      name="resolutionMultiplier"/> is 1, the resolution will match the size (in screen units) of the <see
      cref="PDFRenderer"/>.</param>
00377         /// <param name="includeAnnotations">If this is <see langword="true" />, annotations (e.g.
      signatures) are included in the rendering. Otherwise, only the page contents are included.</param>
00378         /// <param name="ocrLanguage">The language to use for optical character recognition (OCR). If
      this is null, no OCR is performed.</param>
00379         /// <param name="ocrCancellationToken">A <see cref="CancellationToken"/> used to cancel the
      OCR operation.</param>
```

```
00380         /// <param name="ocrProgress">An <see cref="IProgress{OCRProgressInfo}"/> used to report OCR progress.</param>
00381         public async Task InitializeAsync(MemoryStream ms, InputFileTypes fileType, int threadCount = 0, int pageNumber = 0, double resolutionMultiplier = 1, bool includeAnnotations = true, TesseractLanguage ocrLanguage = null, CancellationToken ocrCancellationToken = default, IProgress<OCRProgressInfo> ocrProgress = null)
00382         {
00383             //Get the byte array that underlies the MemoryStream.
00384             int origin = (int)ms.Seek(0, SeekOrigin.Begin);
00385             long dataLength = ms.Length;
00386             byte[] dataBytes = ms.GetBuffer();
00387 
00388             await InitializeAsync(dataBytes, fileType, origin, (int)dataLength, threadCount, pageNumber, resolutionMultiplier, includeAnnotations, ocrLanguage, ocrCancellationToken, ocrProgress);
00389         }
00390 
00391         /// <summary>
00392         /// Set up the <see cref="PDFRenderer"/> to display a page of a document that will be loaded from an array of <see cref="byte"/>s.
00393         /// </summary>
00394         /// <param name="dataBytes">The bytes of the document that should be opened. The array will be copied and can be safely discarded/altered after this method returns.</param>
00395         /// <param name="fileType">The format of the document.</param>
00396         /// <param name="offset">The offset in the byte array at which the document starts.</param>
00397         /// <param name="length">The length of the document in bytes. If this is &lt; 0, the whole array is used.</param>
00398         /// <param name="threadCount">The number of threads to use in the rendering. If this is 0, an appropriate number of threads based on the number of processors in the computer will be used. Otherwise, this must be factorisable using only powers of 2, 3, 5 or 7. If this is not the case, the biggest number smaller than <paramref name="threadCount"/> that satisfies this condition is used.</param>
00399         /// <param name="pageNumber">The index of the page that should be rendered. The first page has index 0.</param>
00400         /// <param name="resolutionMultiplier">This value can be used to increase or decrease the resolution at which the static renderisation of the page will be produced. If <paramref name="resolutionMultiplier"/> is 1, the resolution will match the size (in screen units) of the <see cref="PDFRenderer"/>.</param>
00401         /// <param name="includeAnnotations">If this is <see langword="true" />, annotations (e.g. signatures) are included in the rendering. Otherwise, only the page contents are included.</param>
00402         /// <param name="ocrLanguage">The language to use for optical character recognition (OCR). If this is null, no OCR is performed.</param>
00403         public void Initialize(byte[] dataBytes, InputFileTypes fileType, int offset = 0, int length = -1, int threadCount = 0, int pageNumber = 0, double resolutionMultiplier = 1, bool includeAnnotations = true, TesseractLanguage ocrLanguage = null)
00404         {
00405             if (IsViewerInitialized)
00406             {
00407                 ReleaseResources();
00408             }
00409 
00410             if (length < 0)
00411             {
00412                 length = dataBytes.Length - offset;
00413             }
00414 
00415             //Copy the bytes to unmanaged memory, so that we don't depend on the original array.
00416             IntPtr pointer = Marshal.AllocHGlobal(length);
00417             Marshal.Copy(dataBytes, offset, pointer, length);
00418 
00419             //Wrap the pointer into a disposable container.
00420             IDisposable disposer = new DisposableIntPtr(pointer);
00421 
00422             OwnsContextAndDocument = true;
00423 
00424             Context = new MuPDFContext();
00425 
00426             //Create a new document, passing the wrapped pointer so that it can be released when the Document is disposed.
00427             Document = new MuPDFDocument(Context, pointer, length, fileType, ref disposer);
00428 
00429             ContinueInitialization(threadCount, pageNumber, resolutionMultiplier, includeAnnotations, ocrLanguage);
00430         }
00431 
00432         /// <summary>
00433         /// Set up the <see cref="PDFRenderer"/> to display a page of a document that will be loaded from an array of <see cref="byte"/>s. The OCR step is run asynchronously, in order not to block the UI thread.
00434         /// </summary>
00435         /// <param name="dataBytes">The bytes of the document that should be opened. The array will be copied and can be safely discarded/altered after this method returns.</param>
00436         /// <param name="fileType">The format of the document.</param>
00437         /// <param name="offset">The offset in the byte array at which the document starts.</param>
00438         /// <param name="length">The length of the document in bytes. If this is &lt; 0, the whole array is used.</param>
00439         /// <param name="threadCount">The number of threads to use in the rendering. If this is 0, an
```

```
appropriate number of threads based on the number of processors in the computer will be used.
Otherwise, this must be factorisable using only powers of 2, 3, 5 or 7. If this is not the case, the
biggest number smaller than <paramref name="threadCount"/> that satisfies this condition is
used.</param>
00440         /// <param name="pageNumber">The index of the page that should be rendered. The first page has
index 0.</param>
00441         /// <param name="resolutionMultiplier">This value can be used to increase or decrease the
resolution at which the static renderisation of the page will be produced. If <paramref
name="resolutionMultiplier"/> is 1, the resolution will match the size (in screen units) of the <see
cref="PDFRenderer"/>.</param>
00442         /// <param name="includeAnnotations">If this is <see langword="true" />, annotations (e.g.
signatures) are included in the rendering. Otherwise, only the page contents are included.</param>
00443         /// <param name="ocrLanguage">The language to use for optical character recognition (OCR). If
this is null, no OCR is performed.</param>
00444         /// <param name="ocrCancellationToken">A <see cref="CancellationToken"/> used to cancel the
OCR operation.</param>
00445         /// <param name="ocrProgress">An <see cref="IProgress{OCRProgressInfo}"/> used to report OCR
progress.</param>
00446         public async Task InitializeAsync(byte[] dataBytes, InputFileTypes fileType, int offset = 0,
int length = -1, int threadCount = 0, int pageNumber = 0, double resolutionMultiplier = 1, bool
includeAnnotations = true, TesseractLanguage ocrLanguage = null, CancellationToken
ocrCancellationToken = default, IProgress<OCRProgressInfo> ocrProgress = null)
00447         {
00448             if (IsViewerInitialized)
00449             {
00450                 ReleaseResources();
00451             }
00452
00453             if (length < 0)
00454             {
00455                 length = dataBytes.Length - offset;
00456             }
00457
00458             //Copy the bytes to unmanaged memory, so that we don't depend on the original array.
00459             IntPtr pointer = Marshal.AllocHGlobal(length);
00460             Marshal.Copy(dataBytes, offset, pointer, length);
00461
00462             //Wrap the pointer into a disposable container.
00463             IDisposable disposer = new DisposableIntPtr(pointer);
00464
00465             OwnsContextAndDocument = true;
00466
00467             Context = new MuPDFContext();
00468
00469             //Create a new document, passing the wrapped pointer so that it can be released when the
Document is disposed.
00470             Document = new MuPDFDocument(Context, pointer, length, fileType, ref disposer);
00471
00472             await ContinueInitializationAsync(threadCount, pageNumber, resolutionMultiplier,
includeAnnotations, ocrLanguage, ocrCancellationToken, ocrProgress);
00473         }
00474
00475         /// <summary>
00476         /// Common steps in the initialization process that will be performed regardless of how the
<see cref="Document"/> was obtained.
00477         /// </summary>
00478         /// <param name="threadCount">The number of threads to use in the rendering. If this is 0, an
appropriate number of threads based on the number of processors in the computer will be used.
Otherwise, this must be factorisable using only powers of 2, 3, 5 or 7. If this is not the case, the
biggest number smaller than <paramref name="threadCount"/> that satisfies this condition is
used.</param>
00479         /// <param name="pageNumber">The index of the page that should be rendered. The first page has
index 0.</param>
00480         /// <param name="resolutionMultiplier">This value can be used to increase or decrease the
resolution at which the static renderisation of the page will be produced. If <paramref
name="resolutionMultiplier"/> is 1, the resolution will match the size (in screen units) of the <see
cref="PDFRenderer"/>.</param>
00481         /// <param name="includeAnnotations">If this is <see langword="true" />, annotations (e.g.
signatures) are included in the rendering. Otherwise, only the page contents are included.</param>
00482         /// /// <param name="ocrLanguage">The language to use for optical character recognition (OCR).
If this is null, no OCR is performed.</param>
00483         private void ContinueInitialization(int threadCount, int pageNumber, double
resolutionMultiplier, bool includeAnnotations, TesseractLanguage ocrLanguage = null)
00484         {
00485             //Initialise threads and locking mechanics.
00486             if (RenderMutex == null)
00487             {
00488                 RenderMutex = new Mutex(false);
00489
00490                 this.RenderDynamicCanvasOuterThread = new Thread(() =>
00491                 {
00492                     RenderDynamicCanvasOuterAction();
00493                 });
00494
00495                 this.RenderDynamicCanvasInnerThread = new Thread(() =>
00496                 {
00497                     RenderDynamicCanvasInnerAction();
```

```
00498                 });
00499
00500                 RenderDynamicCanvasOuterThread.Start();
00501                 RenderDynamicCanvasInnerThread.Start();
00502             }
00503
00504             //Choose an appropriate number of threads based on the number of processors in the
      computer. We have an upper limit of 8 threads because more threads apparently caused reduced
      performance due to the synchronisation overhead.
00505             if (threadCount <= 0)
00506             {
00507                 threadCount = Math.Max(1, Math.Min(8, Environment.ProcessorCount - 2));
00508             }
00509
00510             //Create the structured text representation.
00511             this.StructuredTextPage = Document.GetStructuredTextPage(pageNumber, ocrLanguage,
      includeAnnotations);
00512
00513             //Create the multithreaded renderer.
00514             Renderer = Document.GetMultiThreadedRenderer(pageNumber, threadCount, includeAnnotations);
00515
00516             //Set up the properties of this control.
00517             RenderThreadCount = Renderer.ThreadCount;
00518             Rectangle bounds = Document.Pages[pageNumber].Bounds;
00519             PageSize = new Rect(new Point(bounds.X0, bounds.Y0), new Point(bounds.X1, bounds.Y1));
00520             PageNumber = pageNumber;
00521
00522             //Render the static canvas (which is used when the DynamicBitmaps are not available).
00523             RenderFixedCanvas(resolutionMultiplier);
00524
00525             //Initialize the dynamic canvas.
00526             InitializeDynamicCanvas();
00527
00528             //Set initial display area to include the whole page.
00529             double widthRatio = PageSize.Width / (this.Bounds.Width * resolutionMultiplier);
00530             double heightRatio = PageSize.Height / (this.Bounds.Height * resolutionMultiplier);
00531
00532             double containingWidth = Math.Max(widthRatio, heightRatio) * this.Bounds.Width *
      resolutionMultiplier;
00533             double containingHeight = Math.Max(widthRatio, heightRatio) * this.Bounds.Height *
      resolutionMultiplier;
00534
00535             SetDisplayAreaNowInternal(new Rect(new Point(-(containingWidth - FixedArea.Width) * 0.5,
      -(containingHeight - FixedArea.Height) * 0.5), new Avalonia.Size(containingWidth,
      containingHeight)));
00536
00537             //We are ready!
00538             IsViewerInitialized = true;
00539
00540             //Queue a render of the DynamicBitmaps (on another thread).
00541             RenderDynamicCanvas();
00542         }
00543
00544
00545         /// <summary>
00546         /// Common steps in the initialization process that will be performed regardless of how the
      <see cref="Document"/> was obtained. The OCR step is run asynchronously, in order not to block the UI
      thread.
00547         /// </summary>
00548         /// <param name="threadCount">The number of threads to use in the rendering. If this is 0, an
      appropriate number of threads based on the number of processors in the computer will be used.
      Otherwise, this must be factorisable using only powers of 2, 3, 5 or 7. If this is not the case, the
      biggest number smaller than <paramref name="threadCount"/> that satisfies this condition is
      used.</param>
00549         /// <param name="pageNumber">The index of the page that should be rendered. The first page has
      index 0.</param>
00550         /// <param name="resolutionMultiplier">This value can be used to increase or decrease the
      resolution at which the static renderisation of the page will be produced. If <paramref
      name="resolutionMultiplier"/> is 1, the resolution will match the size (in screen units) of the <see
      cref="PDFRenderer"/>.</param>
00551         /// <param name="includeAnnotations">If this is <see langword="true" />, annotations (e.g.
      signatures) are included in the rendering. Otherwise, only the page contents are included.</param>
00552         /// <param name="ocrLanguage">The language to use for optical character recognition (OCR). If
      this is null, no OCR is performed.</param>
00553         /// <param name="ocrCancellationToken">A <see cref="CancellationToken"/> used to cancel the
      OCR operation.</param>
00554         /// <param name="ocrProgress">An <see cref="IProgress{OCRProgressInfo}"/> used to report OCR
      progress.</param>
00555         private async Task ContinueInitializationAsync(int threadCount, int pageNumber, double
      resolutionMultiplier, bool includeAnnotations, TesseractLanguage ocrLanguage, CancellationToken
      ocrCancellationToken, IProgress<OCRProgressInfo> ocrProgress)
00556         {
00557             //Initialise threads and locking mechanics.
00558             if (RenderMutex == null)
00559             {
00560                 RenderMutex = new Mutex(false);
00561
```

```
00562                 this.RenderDynamicCanvasOuterThread = new Thread(() =>
00563                 {
00564                     RenderDynamicCanvasOuterAction();
00565                 });
00566 
00567                 this.RenderDynamicCanvasInnerThread = new Thread(() =>
00568                 {
00569                     RenderDynamicCanvasInnerAction();
00570                 });
00571 
00572                 RenderDynamicCanvasOuterThread.Start();
00573                 RenderDynamicCanvasInnerThread.Start();
00574             }
00575 
00576             //Choose an appropriate number of threads based on the number of processors in the
    computer. We have an upper limit of 8 threads because more threads apparently caused reduced
    performance due to the synchronisation overhead.
00577             if (threadCount <= 0)
00578             {
00579                 threadCount = Math.Max(1, Math.Min(8, Environment.ProcessorCount - 2));
00580             }
00581 
00582             //Create the structured text representation.
00583             this.StructuredTextPage = await Document.GetStructuredTextPageAsync(pageNumber,
    ocrLanguage, includeAnnotations, ocrCancellationToken, ocrProgress);
00584 
00585             //Create the multithreaded renderer.
00586             Renderer = Document.GetMultiThreadedRenderer(pageNumber, threadCount, includeAnnotations);
00587 
00588             //Set up the properties of this control.
00589             RenderThreadCount = Renderer.ThreadCount;
00590             Rectangle bounds = Document.Pages[pageNumber].Bounds;
00591             PageSize = new Rect(new Point(bounds.X0, bounds.Y0), new Point(bounds.X1, bounds.Y1));
00592             PageNumber = pageNumber;
00593 
00594             //Render the static canvas (which is used when the DynamicBitmaps are not available).
00595             RenderFixedCanvas(resolutionMultiplier);
00596 
00597             //Initialize the dynamic canvas.
00598             InitializeDynamicCanvas();
00599 
00600             //Set initial display area to include the whole page.
00601             double widthRatio = PageSize.Width / (this.Bounds.Width * resolutionMultiplier);
00602             double heightRatio = PageSize.Height / (this.Bounds.Height * resolutionMultiplier);
00603 
00604             double containingWidth = Math.Max(widthRatio, heightRatio) * this.Bounds.Width *
    resolutionMultiplier;
00605             double containingHeight = Math.Max(widthRatio, heightRatio) * this.Bounds.Height *
    resolutionMultiplier;
00606 
00607             SetDisplayAreaNowInternal(new Rect(new Point(-(containingWidth - FixedArea.Width) * 0.5,
    -(containingHeight - FixedArea.Height) * 0.5), new Avalonia.Size(containingWidth,
    containingHeight)));
00608 
00609             //We are ready!
00610             IsViewerInitialized = true;
00611 
00612             //Queue a render of the DynamicBitmaps (on another thread).
00613             RenderDynamicCanvas();
00614         }
00615 
00616         /// <summary>
00617         /// Release resources held by this PDFRenderer. This is not an irreversible step: using one of
    the Initialize overloads after calling this method will restore functionality.
00618         /// </summary>
00619         public void ReleaseResources()
00620         {
00621             IsViewerInitialized = false;
00622             this.Renderer?.Dispose();
00623             this.StructuredTextPage = null;
00624             this.Selection = null;
00625             this.HighlightedRegions = null;
00626 
00627             if (OwnsContextAndDocument)
00628             {
00629                 this.Document?.Dispose();
00630                 this.Context?.Dispose();
00631             }
00632         }
00633 
00634         /// <summary>
00635         /// Called when the PDFRenderer is removed from the logical tree (e.g. it is removed from the
    window, or the window containing it is closed). We assume that this renderer is not needed anymore.
    This is irreversible!
00636         /// </summary>
00637         private void ControlDetachedFromLogicalTree(object sender, LogicalTreeAttachmentEventArgs e)
00638         {
```

```
00639             RendererDisposedHandle.Set();
00640             ReleaseResources();
00641         }
00642 
00643 
00644         /// <summary>
00645         /// Set the current display area to the specified <paramref name="value"/>, skipping all
      transitions. This also skips sanity checks of the <paramref name="value"/>, since the calling methods
      will already have performed them.
00646         /// </summary>
00647         /// <param name="value">The new display area.</param>
00648         private void SetDisplayAreaNowInternal(Rect value)
00649         {
00650             Transitions prevTransitions = this.Transitions;
00651             this.Transitions = null;
00652             SetValue(DisplayAreaProperty, value);
00653             this.Transitions = prevTransitions;
00654         }
00655 
00656         /// <summary>
00657         /// Set the current display area to the specified <paramref name="value"/>, skipping all
      transitions.
00658         /// </summary>
00659         /// <param name="value">The new display area.</param>
00660         public void SetDisplayAreaNow(Rect value)
00661         {
00662             Transitions prevTransitions = this.Transitions;
00663             this.Transitions = null;
00664             this.DisplayArea = value;
00665             this.Transitions = prevTransitions;
00666         }
00667 
00668         /// <summary>
00669         /// Zoom around a point.
00670         /// </summary>
00671         /// <param name="count">Number of steps to zoom. Positive values indicate a zoom in, negative
      values a zoom out.</param>
00672         /// <param name="center">The point around which to center the zoom operation. If this is null,
      the center of the control is used.</param>
00673         public void ZoomStep(double count, Point? center = null)
00674         {
00675             if (center == null)
00676             {
00677                 center = new Point(this.Bounds.Width * 0.5, this.Bounds.Height * 0.5);
00678             }
00679 
00680             double currZoomX = FixedArea.Width / DisplayArea.Width;
00681             double currZoomY = FixedArea.Height / DisplayArea.Height;
00682 
00683             currZoomX *= Math.Pow(ZoomIncrement, count);
00684             currZoomY *= Math.Pow(ZoomIncrement, count);
00685 
00686             double currWidth = FixedArea.Width / currZoomX;
00687             double currHeight = FixedArea.Height / currZoomY;
00688 
00689             double deltaW = currWidth - DisplayArea.Width;
00690             double deltaH = currHeight - DisplayArea.Height;
00691 
00692             SetValue(DisplayAreaProperty, new Rect(new Point(DisplayArea.X - deltaW * center.Value.X /
      this.Bounds.Width, DisplayArea.Y - deltaH * center.Value.Y / this.Bounds.Height), new
      Point(DisplayArea.Right + deltaW * (1 - center.Value.X / this.Bounds.Width), DisplayArea.Bottom +
      deltaH * (1 - center.Value.Y / this.Bounds.Height))));
00693         }
00694 
00695         /// <summary>
00696         /// Alter the display area so that the whole page fits on screen.
00697         /// </summary>
00698         public void Contain()
00699         {
00700             //This will be sanitised by the property setter.
00701             this.DisplayArea = this.PageSize;
00702         }
00703 
00704         /// <summary>
00705         /// Alter the display area so that the page covers the whole surface of the <see
      cref="PDFRenderer"/> (even though parts of the page may be outside it).
00706         /// </summary>
00707         public void Cover()
00708         {
00709             double widthRatio = this.PageSize.Width / (this.Bounds.Width);
00710             double heightRatio = this.PageSize.Height / (this.Bounds.Height);
00711 
00712             double containingWidth = Math.Min(widthRatio, heightRatio) * this.Bounds.Width;
00713             double containingHeight = Math.Min(widthRatio, heightRatio) * this.Bounds.Height;
00714 
00715             double deltaW = (containingWidth - this.PageSize.Width) * 0.5;
00716             double deltaH = (containingHeight - this.PageSize.Height) * 0.5;
```

```
00717
00718           Rect newDispArea = new Rect(new Point(this.PageSize.X - deltaW, this.PageSize.Y - deltaH),
    new Point(this.PageSize.Right + deltaW, this.PageSize.Bottom + deltaH));
00719
00720           //Skip sanitation.
00721           SetValue(DisplayAreaProperty, newDispArea);
00722       }
00723
00724       /// <summary>
00725       /// Get the current rendering progress.
00726       /// </summary>
00727       /// <returns>A <see cref="RenderProgress"/> object with information about the rendering
    progress of each thread.</returns>
00728       public RenderProgress GetProgress()
00729       {
00730           return Renderer.GetProgress();
00731       }
00732
00733       /// <summary>
00734       /// Get the currently selected text.
00735       /// </summary>
00736       /// <returns>The currently selected text.</returns>
00737       public string GetSelectedText()
00738       {
00739           return this.StructuredTextPage.GetText(this.Selection);
00740       }
00741
00742       /// <summary>
00743       /// Selects all the text in the document.
00744       /// </summary>
00745       public void SelectAll()
00746       {
00747           if (this.StructuredTextPage.Count > 0)
00748           {
00749               int maxBlock = this.StructuredTextPage.Count - 1;
00750               int maxLine = this.StructuredTextPage[maxBlock].Count - 1;
00751               int maxCharacter = this.StructuredTextPage[maxBlock][maxLine].Count - 1;
00752
00753               this.Selection = new MuPDFStructuredTextAddressSpan(new MuPDFStructuredTextAddress(0,
    0, 0), new MuPDFStructuredTextAddress(maxBlock, maxLine, maxCharacter));
00754           }
00755           else
00756           {
00757               this.Selection = null;
00758           }
00759       }
00760
00761       /// <summary>
00762       /// Highlights all matches of the specified <see cref="Regex"/> in the text and returns the
    number of matches found. Matches cannot span multiple lines.
00763       /// </summary>
00764       /// <param name="needle">The <see cref="Regex"/> to search for.</param>
00765       /// <returns>The number of matches that have been found.</returns>
00766       public int Search(Regex needle)
00767       {
00768           List<MuPDFStructuredTextAddressSpan> spans =
    this.StructuredTextPage.Search(needle).ToList();
00769           this.HighlightedRegions = spans;
00770           return spans.Count;
00771       }
00772
00773       /// <summary>
00774       /// Render the <see cref="FixedCanvasBitmap"/>.
00775       /// </summary>
00776       /// <param name="resolutionMultiplier">This value can be used to increase or decrease the
    resolution at which the static renderisation of the page will be produced. If <paramref
    name="resolutionMultiplier"/> is 1, the resolution will match the size (in screen units) of the <see
    cref="PDFRenderer"/>.</param>
00777       private void RenderFixedCanvas(double resolutionMultiplier)
00778       {
00779           //Take into account DPI scaling.
00780           resolutionMultiplier *= (VisualRoot as ILayoutRoot)?.LayoutScaling ?? 1;
00781
00782           double widthRatio = PageSize.Width / (this.Bounds.Width * resolutionMultiplier);
00783           double heightRatio = PageSize.Height / (this.Bounds.Height * resolutionMultiplier);
00784
00785           double zoom = 1 / Math.Min(widthRatio, heightRatio);
00786
00787           //Render the whole page
00788           Rectangle origin = new Rectangle(0, 0, PageSize.Width, PageSize.Height);
00789
00790           FixedArea = origin;
00791
00792           RoundedRectangle roundedOrigin = origin.Round(zoom);
00793
00794           RoundedSize targetSize = new RoundedSize(roundedOrigin.Width, roundedOrigin.Height);
00795           if (FixedCanvasBitmap == null)
```

```
00796             {
00797                 FixedCanvasBitmap = new WriteableBitmap(new PixelSize(targetSize.Width,
      targetSize.Height), new Vector(72, 72), Avalonia.Platform.PixelFormat.Rgba8888,
      AlphaFormat.Unpremul);
00798             }
00799             else
00800             {
00801                 if (FixedCanvasBitmap.PixelSize.Width != targetSize.Width ||
      FixedCanvasBitmap.PixelSize.Height != targetSize.Height)
00802                 {
00803                     FixedCanvasBitmap = new WriteableBitmap(new PixelSize(targetSize.Width,
      targetSize.Height), new Vector(72, 72), Avalonia.Platform.PixelFormat.Rgba8888,
      AlphaFormat.Unpremul);
00804                 }
00805             }
00806 
00807             //Render the page to the FixedCanvasBitmap (without marshaling).
00808             using (ILockedFramebuffer fb = FixedCanvasBitmap.Lock())
00809             {
00810                 Document.Render(PageNumber, origin, zoom, PixelFormats.RGBA, fb.Address);
00811             }
00812         }
00813 
00814         /// <summary>
00815         /// Set up the <see cref="DynamicBitmaps"/> array with an appropriate number of <see
      cref="WriteableBitmap"/> of the appropriate size.
00816         /// </summary>
00817         private void InitializeDynamicCanvas()
00818         {
00819             //Take into account DPI scaling.
00820             double scale = (VisualRoot as ILayoutRoot)?.LayoutScaling ?? 1;
00821 
00822             //Acquire the render mutex (we don't want anyone to touch the DynamicBitmaps while we are
      resizing them!)
00823             RenderMutex.WaitOne();
00824             RoundedSize targetSize = new RoundedSize((int)Math.Ceiling(this.Bounds.Width * scale),
      (int)Math.Ceiling(this.Bounds.Height * scale));
00825 
00826             //Split the target size into an appropriate number of tiles.
00827             RoundedRectangle[] splitSizes = targetSize.Split(RenderThreadCount);
00828 
00829             DynamicImagesBounds = splitSizes;
00830 
00831             if (DynamicBitmaps == null || DynamicBitmaps.Length != RenderThreadCount)
00832             {
00833                 DynamicBitmaps = new WriteableBitmap[RenderThreadCount];
00834                 for (int i = 0; i < splitSizes.Length; i++)
00835                 {
00836                     DynamicBitmaps[i] = new WriteableBitmap(new PixelSize(splitSizes[i].Width,
      splitSizes[i].Height), new Vector(72, 72), Avalonia.Platform.PixelFormat.Rgba8888,
      AlphaFormat.Unpremul);
00837                 }
00838             }
00839             else
00840             {
00841                 for (int i = 0; i < splitSizes.Length; i++)
00842                 {
00843                     if (DynamicBitmaps[i].PixelSize.Width != splitSizes[i].Width ||
      DynamicBitmaps[i].PixelSize.Height != splitSizes[i].Height)
00844                     {
00845                         DynamicBitmaps[i] = new WriteableBitmap(new PixelSize(splitSizes[i].Width,
      splitSizes[i].Height), new Vector(72, 72), Avalonia.Platform.PixelFormat.Rgba8888,
      AlphaFormat.Unpremul);
00846                     }
00847                 }
00848             }
00849 
00850             //Release the render mutex.
00851             RenderMutex.ReleaseMutex();
00852         }
00853 
00854         /// <summary>
00855         /// The outer loop that is executed by the <see cref="RenderDynamicCanvasOuterThread"/>, which
      is in charge of responding to the rendering requests and either starting a new rendering of the <see
      cref="DynamicBitmaps"/>, or queueing it.
00856         /// </summary>
00857         private void RenderDynamicCanvasOuterAction()
00858         {
00859             EventWaitHandle[] handles = new EventWaitHandle[] { RenderDynamicCanvasOuterHandle,
      RendererDisposedHandle };
00860 
00861             while (true)
00862             {
00863                 int result = EventWaitHandle.WaitAny(handles);
00864 
00865                 if (result == 0)
00866                 {
```

```
00867                   //So that we don't lose consecutive requests.
00868                   RenderDynamicCanvasOuterHandle.Reset();
00869
00870                   //Check if the rendering is already in progress.
00871                   if (RenderMutex.WaitOne(0))
00872                   {
00873                       //Start a new rendering
00874                       AreDynamicBitmapsReady = false;
00875
00876                       //This handle will be set by the inner thread once it starts rendering.
00877                       RenderDynamicCanvasInnerStartedHandle.Reset();
00878
00879                       //Tell the inner thread to start rendering.
00880                       RenderDynamicCanvasInnerHandle.Set();
00881
00882                       //Release the mutex so that the inner thread can start rendering.
00883                       RenderMutex.ReleaseMutex();
00884
00885                       //Wait until the inner thread has acuired the mutex and started rendering.
00886                       RenderDynamicCanvasInnerStartedHandle.WaitOne();
00887                   }
00888                   else
00889                   {
00890                       if (!RenderQueued)
00891                       {
00892                           //Queue another rendering pass.
00893                           RenderQueued = true;
00894
00895                           //Abort the current rendering pass.
00896                           Renderer.Abort();
00897                       }
00898                   }
00899               }
00900               else
00901               {
00902                   //The renderer is being disposed, we need to quit!
00903                   break;
00904               }
00905           }
00906       }
00907
00908       /// <summary>
00909       /// The inner loop that is executed by the <see cref="RenderDynamicCanvasInnerThread"/>, which
      renders the <see cref="DynamicBitmaps"/>.
00910       /// </summary>
00911       private void RenderDynamicCanvasInnerAction()
00912       {
00913           EventWaitHandle[] handles = new EventWaitHandle[] { RenderDynamicCanvasInnerHandle,
      RendererDisposedHandle };
00914
00915           bool ownsMutex = false;
00916
00917           while (true)
00918           {
00919               int result = EventWaitHandle.WaitAny(handles);
00920
00921               if (result == 0)
00922               {
00923                   //So that we don't lose consecutive requests.
00924                   RenderDynamicCanvasInnerHandle.Reset();
00925
00926                   //Acquire the mutex only if have not acquired it yet.
00927                   if (!ownsMutex)
00928                   {
00929                       RenderMutex.WaitOne();
00930                       ownsMutex = true;
00931                   }
00932
00933                   //Signal to the outer thread that we have acquired the mutex. Even if the outer
      thread is not waiting for this signal, it will reset it before waiting for it.
00934                   RenderDynamicCanvasInnerStartedHandle.Set();
00935
00936                   //Set up the pointers to the contents of the DynamicBitmaps
00937                   IntPtr[] destinations = new IntPtr[RenderThreadCount];
00938                   ILockedFramebuffer[] fbs = new ILockedFramebuffer[RenderThreadCount];
00939
00940                   for (int i = 0; i < RenderThreadCount; i++)
00941                   {
00942                       fbs[i] = DynamicBitmaps[i].Lock();
00943                       destinations[i] = fbs[i].Address;
00944                   }
00945
00946                   //Prevent race conditions.
00947                   Rectangle target;
00948                   int width;
00949                   int height;
00950                   lock (RenderDisplayAreaLock)
```

```
00951                   {
00952                       target = new Rectangle(RenderDisplayArea.X, RenderDisplayArea.Y,
      RenderDisplayArea.Right, RenderDisplayArea.Bottom);
00953                       width = RenderSize[0];
00954                       height = RenderSize[1];
00955                   }
00956
00957                   //Start the multithreaded rendering and wait until it finishes.
00958                   Renderer.Render(new RoundedSize(width, height), target, destinations,
      PixelFormats.RGBA);
00959
00960                   //Free the pointers.
00961                   for (int i = 0; i < RenderThreadCount; i++)
00962                   {
00963                       fbs[i].Dispose();
00964                   }
00965
00966                   //Check whether another rendering request has been queued.
00967                   if (!RenderQueued)
00968                   {
00969                       //No other rendering requests have been queued.
00970                       AreDynamicBitmapsReady = true;
00971
00972                       //This should always be true. Release the rendering mutex.
00973                       if (ownsMutex)
00974                       {
00975                           RenderMutex.ReleaseMutex();
00976                           ownsMutex = false;
00977                       }
00978
00979                       //Signal to the UI that a repaint is required.
00980                       Dispatcher.UIThread.InvokeAsync(() =>
00981                       {
00982                           this.InvalidateVisual();
00983                       });
00984                   }
00985                   else
00986                   {
00987                       //Another rendering request has been queued, we can assume that whatever we
      have rendered until now is useless (maybe because the rendering has been aborted).
00988                       RenderQueued = false;
00989
00990                       //Self-signal.
00991                       RenderDynamicCanvasInnerHandle.Set();
00992                   }
00993               }
00994               else
00995               {
00996                   //The renderer is being disposed, we need to quit!
00997                   break;
00998               }
00999           }
01000       }
01001
01002       /// <summary>
01003       /// Signal to the <see cref="RenderDynamicCanvasOuterThread"/> that a rendering has been
      requested.
01004       /// </summary>
01005       private void RenderDynamicCanvas()
01006       {
01007           //Take into account DPI scaling.
01008           double scale = (VisualRoot as ILayoutRoot).LayoutScaling;
01009
01010           //Set up rendering size
01011           lock (RenderDisplayAreaLock)
01012           {
01013               RenderSize[0] = (int)Math.Ceiling(this.Bounds.Width * scale);
01014               RenderSize[1] = (int)Math.Ceiling(this.Bounds.Height * scale);
01015               RenderDisplayArea = DisplayArea;
01016           }
01017
01018           //Send the signal.
01019           RenderDynamicCanvasOuterHandle.Set();
01020       }
01021
01022       /// <summary>
01023       /// Resizes the <see cref="DynamicBitmaps"/> when the size of the control changes and queues a
      repaint when the <see cref="DisplayArea"/> changes.
01024       /// </summary>
01025       /// <param name="sender"></param>
01026       /// <param name="e"></param>
01027       private void ControlPropertyChanged(object sender, AvaloniaPropertyChangedEventArgs e)
01028       {
01029           if (e.Property == UserControl.BoundsProperty)
01030           {
01031               if (IsViewerInitialized)
01032               {
```

```
01033                   //Resize the display area
01034                   Rect oldBounds = (Rect)e.OldValue;
01035                   Rect newBounds = (Rect)e.NewValue;
01036
01037                   double deltaW = (newBounds.Width - oldBounds.Width) / oldBounds.Width *
      DisplayArea.Width;
01038                   double deltaH = (newBounds.Height - oldBounds.Height) / oldBounds.Height *
      DisplayArea.Height;
01039
01040                   Rect target = new Rect(new Point(DisplayArea.X - deltaW * 0.5, DisplayArea.Y -
      deltaH * 0.5), new Point(DisplayArea.Right + deltaW * 0.5, DisplayArea.Bottom + deltaH * 0.5));
01041
01042                   //Resize the DynamicBitmaps
01043                   InitializeDynamicCanvas();
01044
01045                   //Set the new DisplayArea, skipping any animation.
01046                   SetDisplayAreaNowInternal(target);
01047               }
01048           }
01049           else if (e.Property == PDFRenderer.DisplayAreaProperty)
01050           {
01051               if (IsViewerInitialized)
01052               {
01053                   //Update the value of the Zoom property.
01054                   ComputeZoom();
01055
01056                   //Signal that a repaint is needed
01057                   this.InvalidateVisual();
01058
01059                   //Queue a new rendering of the DynamicBitmaps
01060                   RenderDynamicCanvas();
01061               }
01062           }
01063           else if (e.Property == PDFRenderer.SelectionProperty && this.StructuredTextPage != null)
01064           {
01065               //Update the selection quads to reflect the new selection
01066               this.SelectionQuads = this.StructuredTextPage.GetHighlightQuads(this.Selection,
      false).ToList();
01067               this.InvalidateVisual();
01068           }
01069           else if (e.Property == PDFRenderer.HighlightedRegionsProperty && this.StructuredTextPage
      != null)
01070           {
01071               //Update the highlight quads to reflect the new highlighted regions
01072               this.HighlightQuads = new List<Quad>();
01073
01074               if (this.HighlightedRegions != null)
01075               {
01076                   foreach (MuPDFStructuredTextAddressSpan span in this.HighlightedRegions)
01077                   {
01078                       this.HighlightQuads.AddRange(this.StructuredTextPage.GetHighlightQuads(span,
      false));
01079                   }
01080               }
01081
01082               this.InvalidateVisual();
01083           }
01084       }
01085
01086       /// <summary>
01087       /// Default handler for the PointerPressed event (start panning).
01088       /// </summary>
01089       /// <param name="sender"></param>
01090       /// <param name="e"></param>
01091       private void ControlPointerPressed(object sender, PointerPressedEventArgs e)
01092       {
01093           if (PointerEventHandlersType == PointerEventHandlers.Pan)
01094           {
01095               if (e.GetCurrentPoint(this).Properties.PointerUpdateKind ==
      PointerUpdateKind.LeftButtonPressed)
01096               {
01097                   IsMouseDown = true;
01098                   MouseDownPoint = e.GetPosition(this);
01099                   MouseDownDisplayArea = DisplayArea;
01100                   this.Cursor = new Cursor(StandardCursorType.SizeAll);
01101               }
01102           }
01103           else if (PointerEventHandlersType == PointerEventHandlers.Highlight)
01104           {
01105               if (e.GetCurrentPoint(this).Properties.PointerUpdateKind ==
      PointerUpdateKind.LeftButtonPressed)
01106               {
01107                   Point point = e.GetPosition(this);
01108
01109                   IsMouseDown = true;
01110                   MouseDownPoint = point;
01111                   MouseDownDisplayArea = DisplayArea;
```

```
01112
01113                   PointF pagePoint = new PointF((float)(point.X / this.Bounds.Width *
      DisplayArea.Width + DisplayArea.Left), (float)(point.Y / this.Bounds.Height * DisplayArea.Height +
      DisplayArea.Top));
01114
01115                   MuPDFStructuredTextAddress? address = StructuredTextPage?.GetHitAddress(pagePoint,
      false);
01116
01117                   if (address != null)
01118                   {
01119                       this.Selection = new MuPDFStructuredTextAddressSpan(address.Value, null);
01120                   }
01121                   else
01122                   {
01123                       this.Selection = null;
01124                   }
01125               }
01126           }
01127           else if (PointerEventHandlersType == PointerEventHandlers.PanHighlight)
01128           {
01129               Point point = e.GetPosition(this);
01130               PointF pagePoint = new PointF((float)(point.X / this.Bounds.Width * DisplayArea.Width
      + DisplayArea.Left), (float)(point.Y / this.Bounds.Height * DisplayArea.Height + DisplayArea.Top));
01131               MuPDFStructuredTextAddress? address = StructuredTextPage?.GetHitAddress(pagePoint,
      false);
01132
01133               if (address == null)
01134               {
01135                   if (e.GetCurrentPoint(this).Properties.PointerUpdateKind ==
      PointerUpdateKind.LeftButtonPressed)
01136                   {
01137                       IsMouseDown = true;
01138                       MouseDownPoint = e.GetPosition(this);
01139                       MouseDownDisplayArea = DisplayArea;
01140                       this.Cursor = new Cursor(StandardCursorType.SizeAll);
01141                       CurrentMouseOperation = CurrentMouseOperations.Pan;
01142                   }
01143               }
01144               else
01145               {
01146                   if (e.GetCurrentPoint(this).Properties.PointerUpdateKind ==
      PointerUpdateKind.LeftButtonPressed)
01147                   {
01148                       IsMouseDown = true;
01149                       MouseDownPoint = point;
01150                       MouseDownDisplayArea = DisplayArea;
01151
01152                       this.Selection = new MuPDFStructuredTextAddressSpan(address.Value, null);
01153                       CurrentMouseOperation = CurrentMouseOperations.Highlight;
01154                   }
01155               }
01156           }
01157       }
01158
01159       /// <summary>
01160       /// Default handler for the PointerReleased event (finish panning).
01161       /// </summary>
01162       /// <param name="sender"></param>
01163       /// <param name="e"></param>
01164       private void ControlPointerReleased(object sender, PointerReleasedEventArgs e)
01165       {
01166           if (PointerEventHandlersType == PointerEventHandlers.Pan)
01167           {
01168               if (e.InitialPressMouseButton == MouseButton.Left)
01169               {
01170                   IsMouseDown = false;
01171                   this.Cursor = new Cursor(StandardCursorType.Arrow);
01172               }
01173           }
01174           else if (PointerEventHandlersType == PointerEventHandlers.Highlight)
01175           {
01176               if (e.InitialPressMouseButton == MouseButton.Left)
01177               {
01178                   IsMouseDown = false;
01179                   if (e.GetPosition(this).Equals(MouseDownPoint))
01180                   {
01181                       this.Selection = null;
01182                   }
01183               }
01184           }
01185           else if (PointerEventHandlersType == PointerEventHandlers.PanHighlight)
01186           {
01187               if (e.InitialPressMouseButton == MouseButton.Left)
01188               {
01189                   IsMouseDown = false;
01190                   if (CurrentMouseOperation == CurrentMouseOperations.Pan)
01191                   {
```

```
01192                       this.Cursor = new Cursor(StandardCursorType.Arrow);
01193                   }
01194                   if (e.GetPosition(this).Equals(MouseDownPoint))
01195                   {
01196                       this.Selection = null;
01197                   }
01198               }
01199           }
01200       }
01201
01202       /// <summary>
01203       /// Default handler for the PointerMoved event (pan).
01204       /// </summary>
01205       /// <param name="sender"></param>
01206       /// <param name="e"></param>
01207       private void ControlPointerMoved(object sender, PointerEventArgs e)
01208       {
01209           if (IsMouseDown)
01210           {
01211               if (PointerEventHandlersType == PointerEventHandlers.Pan || (PointerEventHandlersType
      == PointerEventHandlers.PanHighlight && CurrentMouseOperation == CurrentMouseOperations.Pan))
01212               {
01213
01214                   Point point = e.GetPosition(this);
01215
01216                   double deltaX = (-point.X + MouseDownPoint.X) / this.Bounds.Width *
      DisplayArea.Width;
01217                   double deltaY = (-point.Y + MouseDownPoint.Y) / this.Bounds.Height *
      DisplayArea.Height;
01218
01219                   Rect target = new Rect(new Point(this.MouseDownDisplayArea.X + deltaX,
      this.MouseDownDisplayArea.Y + deltaY), new Point(this.MouseDownDisplayArea.Right + deltaX,
      this.MouseDownDisplayArea.Bottom + deltaY));
01220
01221                   SetDisplayAreaNowInternal(target);
01222                   this.Cursor = new Cursor(StandardCursorType.SizeAll);
01223
01224               }
01225               else if (PointerEventHandlersType == PointerEventHandlers.Highlight ||
      (PointerEventHandlersType == PointerEventHandlers.PanHighlight && CurrentMouseOperation ==
      CurrentMouseOperations.Highlight))
01226               {
01227
01228                   Point point = e.GetPosition(this);
01229
01230                   PointF pagePoint = new PointF((float)(point.X / this.Bounds.Width *
      DisplayArea.Width + DisplayArea.Left), (float)(point.Y / this.Bounds.Height * DisplayArea.Height +
      DisplayArea.Top));
01231
01232                   MuPDFStructuredTextAddress? address =
      StructuredTextPage?.GetClosestHitAddress(pagePoint, false);
01233
01234                   this.Selection = new MuPDFStructuredTextAddressSpan(this.Selection.Start,
      address);
01235
01236                   if (address != null)
01237                   {
01238                       this.Cursor = new Cursor(StandardCursorType.Ibeam);
01239                   }
01240                   else
01241                   {
01242                       this.Cursor = new Cursor(StandardCursorType.Arrow);
01243                   }
01244               }
01245           }
01246           else
01247           {
01248               if (PointerEventHandlersType == PointerEventHandlers.Highlight ||
      PointerEventHandlersType == PointerEventHandlers.PanHighlight)
01249               {
01250                   Point point = e.GetPosition(this);
01251
01252                   PointF pagePoint = new PointF((float)(point.X / this.Bounds.Width *
      DisplayArea.Width + DisplayArea.Left), (float)(point.Y / this.Bounds.Height * DisplayArea.Height +
      DisplayArea.Top));
01253
01254                   MuPDFStructuredTextAddress? address = StructuredTextPage?.GetHitAddress(pagePoint,
      false);
01255
01256                   if (address != null)
01257                   {
01258                       this.Cursor = new Cursor(StandardCursorType.Ibeam);
01259                   }
01260                   else
01261                   {
01262                       this.Cursor = new Cursor(StandardCursorType.Arrow);
01263                   }
```

```
01264                 }
01265                 else
01266                 {
01267                     this.Cursor = new Cursor(StandardCursorType.Arrow);
01268                 }
01269             }
01270         }
01271 
01272         /// <summary>
01273         /// Default handler for the PointerWheelChanged event (zoom in/out).
01274         /// </summary>
01275         /// <param name="sender"></param>
01276         /// <param name="e"></param>
01277         private void ControlPointerWheelChanged(object sender, PointerWheelEventArgs e)
01278         {
01279             if (ZoomEnabled)
01280             {
01281                 ZoomStep(e.Delta.Y, e.GetPosition(this));
01282             }
01283         }
01284 
01285         /// <summary>
01286         /// Compute the current value of the <see cref="Zoom"/> property.
01287         /// </summary>
01288         private void ComputeZoom()
01289         {
01290             //Take into account DPI scaling.
01291             double scale = (VisualRoot as ILayoutRoot).LayoutScaling;
01292             SetAndRaise(ZoomProperty, ref _Zoom, this.Bounds.Width / DisplayArea.Width * 72 / 96 *
      scale);
01293         }
01294 
01295         /// <summary>
01296         /// Draw the rendered document.
01297         /// </summary>
01298         /// <param name="context">The drawing context on which to draw.</param>
01299         public override void Render(DrawingContext context)
01300         {
01301             //Take into account DPI scaling.
01302             double scale = (VisualRoot as ILayoutRoot)?.LayoutScaling ?? 1;
01303 
01304             context.FillRectangle(Background, this.Bounds);
01305 
01306             //Page boundaries (used to draw the page background).
01307             double minX = Math.Max(PageSize.Left, DisplayArea.Left);
01308             double maxX = Math.Min(PageSize.Right, DisplayArea.Right);
01309             double minY = Math.Max(PageSize.Top, DisplayArea.Top);
01310             double maxY = Math.Min(PageSize.Bottom, DisplayArea.Bottom);
01311 
01312 
01313             if (IsViewerInitialized)
01314             {
01315                 bool renderedDynamic = false;
01316 
01317                 //Check if someone is holding the mutex without blocking.
01318                 if (RenderMutex.WaitOne(0))
01319                 {
01320                     //Check if the DynamicBitmaps are ready
01321                     if (AreDynamicBitmapsReady)
01322                     {
01323                         //Page background
01324                         context.FillRectangle(PageBackground, new Rect(new Point((minX -
      DisplayArea.Left) / DisplayArea.Width * this.Bounds.Width, (minY - DisplayArea.Top) /
      DisplayArea.Height * this.Bounds.Height), new Point((maxX - DisplayArea.Left) / DisplayArea.Width *
      this.Bounds.Width, (maxY - DisplayArea.Top) / DisplayArea.Height * this.Bounds.Height)));
01325 
01326                         //Draw the DynamicBitmaps.
01327                         for (int i = 0; i < DynamicImagesBounds.Length; i++)
01328                         {
01329                             context.DrawImage(DynamicBitmaps[i], new Rect(new Point(0, 0),
      DynamicBitmaps[i].PixelSize.ToSize(1)), new Rect(DynamicImagesBounds[i].X0 / scale,
      DynamicImagesBounds[i].Y0 / scale, DynamicImagesBounds[i].Width / scale,
      DynamicImagesBounds[i].Height / scale));
01330                         }
01331 
01332                         //Signal that we don't need to draw the static image.
01333                         renderedDynamic = true;
01334                     }
01335 
01336                     //Release the mutex.
01337                     RenderMutex.ReleaseMutex();
01338                 }
01339 
01340                 //If the DynamicBitmaps have not been drawn, we fall back to drawing the static image
      (which will probably be ugly and pixelated, but better than nothing).
01341                 if (!renderedDynamic)
01342                 {
```

```
01343                   //Page background
01344                   context.FillRectangle(PageBackground, new Rect(new Point((minX - DisplayArea.Left)
/ DisplayArea.Width * this.Bounds.Width, (minY - DisplayArea.Top) / DisplayArea.Height *
this.Bounds.Height), new Point((maxX - DisplayArea.Left) / DisplayArea.Width * this.Bounds.Width,
(maxY - DisplayArea.Top) / DisplayArea.Height * this.Bounds.Height)));
01345
01346                   //Top left corner of the DisplayArea in FixedCanvasBitmap coordinates.
01347                   Point topLeft = new Point((DisplayArea.X - FixedArea.X0) / FixedArea.Width *
FixedCanvasBitmap.PixelSize.Width, (DisplayArea.Y - FixedArea.Y0) / FixedArea.Height *
FixedCanvasBitmap.PixelSize.Height);
01348
01349                   //Size of the DisplayArea in FixedCanvasBitmap coordinates.
01350                   Avalonia.Size size = new Avalonia.Size(DisplayArea.Width / FixedArea.Width *
FixedCanvasBitmap.PixelSize.Width, DisplayArea.Height / FixedArea.Height *
FixedCanvasBitmap.PixelSize.Height);
01351
01352                   //Draw the FixedCanvasBitmap
01353                   context.DrawImage(FixedCanvasBitmap, new Rect(topLeft, size), new Rect(0, 0,
this.Bounds.Width, this.Bounds.Height));
01354
01355                   //Draw the icon signaling that the DynamicBitmaps are still being rendered.
01356                   RefreshingGeometry.Transform = new TranslateTransform(this.Bounds.Width - 38, 32);
01357                   context.DrawGeometry(new SolidColorBrush(Color.FromRgb(119, 170, 221)), null,
RefreshingGeometry);
01358               }
01359
01360               //Draw the highlight quads
01361               if (this.HighlightQuads != null && this.HighlightQuads.Count > 0)
01362               {
01363                   PathGeometry highlightGeometry = new PathGeometry() { FillRule = FillRule.NonZero
};
01364
01365                   for (int i = 0; i < this.HighlightQuads.Count; i++)
01366                   {
01367                       Point ll = new Point((this.HighlightQuads[i].LowerLeft.X -
this.DisplayArea.Left) * this.Bounds.Width / this.DisplayArea.Width,
(this.HighlightQuads[i].LowerLeft.Y - this.DisplayArea.Top) * this.Bounds.Height /
this.DisplayArea.Height);
01368                       Point ul = new Point((this.HighlightQuads[i].UpperLeft.X -
this.DisplayArea.Left) * this.Bounds.Width / this.DisplayArea.Width,
(this.HighlightQuads[i].UpperLeft.Y - this.DisplayArea.Top) * this.Bounds.Height /
this.DisplayArea.Height);
01369                       Point ur = new Point((this.HighlightQuads[i].UpperRight.X -
this.DisplayArea.Left) * this.Bounds.Width / this.DisplayArea.Width,
(this.HighlightQuads[i].UpperRight.Y - this.DisplayArea.Top) * this.Bounds.Height /
this.DisplayArea.Height);
01370                       Point lr = new Point((this.HighlightQuads[i].LowerRight.X -
this.DisplayArea.Left) * this.Bounds.Width / this.DisplayArea.Width,
(this.HighlightQuads[i].LowerRight.Y - this.DisplayArea.Top) * this.Bounds.Height /
this.DisplayArea.Height);
01371
01372                       PathFigure quad = new PathFigure() { StartPoint = ll, IsClosed = true,
IsFilled = true };
01373                       quad.Segments.Add(new LineSegment() { Point = ul });
01374                       quad.Segments.Add(new LineSegment() { Point = ur });
01375                       quad.Segments.Add(new LineSegment() { Point = lr });
01376
01377                       highlightGeometry.Figures.Add(quad);
01378                   }
01379
01380                   context.DrawGeometry(this.HighlightBrush, null, highlightGeometry);
01381               }
01382
01383               //Draw the selection quads
01384               if (this.SelectionQuads != null && this.SelectionQuads.Count > 0)
01385               {
01386                   PathGeometry selectionGeometry = new PathGeometry() { FillRule = FillRule.NonZero
};
01387
01388                   for (int i = 0; i < this.SelectionQuads.Count; i++)
01389                   {
01390                       Point ll = new Point((this.SelectionQuads[i].LowerLeft.X -
this.DisplayArea.Left) * this.Bounds.Width / this.DisplayArea.Width,
(this.SelectionQuads[i].LowerLeft.Y - this.DisplayArea.Top) * this.Bounds.Height /
this.DisplayArea.Height);
01391                       Point ul = new Point((this.SelectionQuads[i].UpperLeft.X -
this.DisplayArea.Left) * this.Bounds.Width / this.DisplayArea.Width,
(this.SelectionQuads[i].UpperLeft.Y - this.DisplayArea.Top) * this.Bounds.Height /
this.DisplayArea.Height);
01392                       Point ur = new Point((this.SelectionQuads[i].UpperRight.X -
this.DisplayArea.Left) * this.Bounds.Width / this.DisplayArea.Width,
(this.SelectionQuads[i].UpperRight.Y - this.DisplayArea.Top) * this.Bounds.Height /
this.DisplayArea.Height);
01393                       Point lr = new Point((this.SelectionQuads[i].LowerRight.X -
this.DisplayArea.Left) * this.Bounds.Width / this.DisplayArea.Width,
(this.SelectionQuads[i].LowerRight.Y - this.DisplayArea.Top) * this.Bounds.Height /
this.DisplayArea.Height);
```

```
01394
01395                           PathFigure quad = new PathFigure() { StartPoint = ll, IsClosed = true,
      IsFilled = true };
01396                           quad.Segments.Add(new LineSegment() { Point = ul });
01397                           quad.Segments.Add(new LineSegment() { Point = ur });
01398                           quad.Segments.Add(new LineSegment() { Point = lr });
01399
01400                           selectionGeometry.Figures.Add(quad);
01401                       }
01402
01403                       context.DrawGeometry(this.SelectionBrush, null, selectionGeometry);
01404                   }
01405               }
01406           }
01407       }
01408 }
```

8.2 PDFRenderer.Properties.cs

```
00001 /*
00002     MuPDFCore.MuPDFRenderer - A control to display documents in Avalonia using MuPDFCore.
00003     Copyright (C) 2020  Giorgio Bianchini
00004
00005     This program is free software: you can redistribute it and/or modify
00006     it under the terms of the GNU Affero General Public License as
00007     published by the Free Software Foundation, version 3.
00008
00009     This program is distributed in the hope that it will be useful,
00010     but WITHOUT ANY WARRANTY; without even the implied warranty of
00011     MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.  See the
00012     GNU Affero General Public License for more details.
00013
00014     You should have received a copy of the GNU Affero General Public License
00015     along with this program.  If not, see <http://www.gnu.org/licenses/>
00016 */
00017
00018 using Avalonia;
00019 using Avalonia.Controls;
00020 using Avalonia.Layout;
00021 using Avalonia.Media;
00022 using System;
00023 using System.Collections.Generic;
00024
00025 namespace MuPDFCore.MuPDFRenderer
00026 {
00027     public partial class PDFRenderer : Control
00028     {
00029         /// <summary>
00030         /// Defines the <see cref="RenderThreadCount"/> property.
00031         /// </summary>
00032         public static readonly DirectProperty<PDFRenderer, int> RenderThreadCountProperty =
      AvaloniaProperty.RegisterDirect<PDFRenderer, int>(nameof(RenderThreadCount), o =>
      o.RenderThreadCount);
00033         /// <summary>
00034         /// Backing field for the <see cref="RenderThreadCount"/> property.
00035         /// </summary>
00036         private int _RenderThreadCount;
00037         /// <summary>
00038         /// Exposes the number of threads that the current instance is using to render the document.
      Read-only.
00039         /// </summary>
00040         public int RenderThreadCount
00041         {
00042             get
00043             {
00044                 return _RenderThreadCount;
00045             }
00046
00047             private set
00048             {
00049                 SetAndRaise(RenderThreadCountProperty, ref _RenderThreadCount, value);
00050             }
00051         }
00052
00053         /// <summary>
00054         /// Defines the <see cref="PageNumber"/> property.
00055         /// </summary>
00056         public static readonly DirectProperty<PDFRenderer, int> PageNumberProperty =
      AvaloniaProperty.RegisterDirect<PDFRenderer, int>(nameof(PageNumber), o => o.PageNumber);
00057         /// <summary>
00058         /// Backing field for the <see cref="PageNumber"/> property.
00059         /// </summary>
00060         private int _PageNumber;
```

```
00061         /// <summary>
00062         /// Exposes the number of the page that the current instance is rendering. Read-only.
00063         /// </summary>
00064         public int PageNumber
00065         {
00066             get
00067             {
00068                 return _PageNumber;
00069             }
00070 
00071             private set
00072             {
00073                 SetAndRaise(PageNumberProperty, ref _PageNumber, value);
00074             }
00075         }
00076 
00077         /// <summary>
00078         /// Defines the <see cref="IsViewerInitialized"/> property.
00079         /// </summary>
00080         public static readonly DirectProperty<PDFRenderer, bool> IsViewerInitializedProperty =
      AvaloniaProperty.RegisterDirect<PDFRenderer, bool>(nameof(IsViewerInitialized), o =>
      o.IsViewerInitialized);
00081         /// <summary>
00082         /// Backing field for the <see cref="IsViewerInitialized"/> property.
00083         /// </summary>
00084         private bool _IsViewerInitialized = false;
00085         /// <summary>
00086         /// Whether the current instance has been initialised with a document to render or not.
      Read-only.
00087         /// </summary>
00088         public bool IsViewerInitialized
00089         {
00090             get
00091             {
00092                 return _IsViewerInitialized;
00093             }
00094 
00095             private set
00096             {
00097                 SetAndRaise(IsViewerInitializedProperty, ref _IsViewerInitialized, value);
00098             }
00099         }
00100 
00101         /// <summary>
00102         /// Defines the <see cref="PageSize"/> property.
00103         /// </summary>
00104         public static readonly DirectProperty<PDFRenderer, Rect> PageSizeProperty =
      AvaloniaProperty.RegisterDirect<PDFRenderer, Rect>(nameof(PageSize), o => o.PageSize);
00105         /// <summary>
00106         /// Backing field for the <see cref="PageSize"/> property.
00107         /// </summary>
00108         private Rect _PageSize;
00109         /// <summary>
00110         /// Exposes the size of the page that is drawn by the current instance (in page units).
00111         /// </summary>
00112         public Rect PageSize
00113         {
00114             get
00115             {
00116                 return _PageSize;
00117             }
00118 
00119             private set
00120             {
00121                 SetAndRaise(PageSizeProperty, ref _PageSize, value);
00122             }
00123         }
00124 
00125         /// <summary>
00126         /// Defines the <see cref="DisplayArea"/> property.
00127         /// </summary>
00128         public static readonly StyledProperty<Rect> DisplayAreaProperty =
      AvaloniaProperty.Register<PDFRenderer, Rect>(nameof(DisplayArea));
00129         /// <summary>
00130         /// The region of the page (in page units) that is currently displayed by the current
      instance. This always has the same aspect ratio of the bounds of this control.
00131         /// When this is set, the value is sanitised so that the smallest rectangle with the correct
      aspect ratio containing the requested value is chosen.
00132         /// </summary>
00133         public Rect DisplayArea
00134         {
00135             get
00136             {
00137                 return GetValue(DisplayAreaProperty);
00138             }
00139 
00140             set
```

```
00141             {
00142                 double widthRatio = value.Width / (this.Bounds.Width);
00143                 double heightRatio = value.Height / (this.Bounds.Height);
00144 
00145                 double containingWidth = Math.Max(widthRatio, heightRatio) * this.Bounds.Width;
00146                 double containingHeight = Math.Max(widthRatio, heightRatio) * this.Bounds.Height;
00147 
00148                 double deltaW = (containingWidth - value.Width) * 0.5;
00149                 double deltaH = (containingHeight - value.Height) * 0.5;
00150 
00151                 Rect newDispArea = new Rect(new Point(value.X - deltaW, value.Y - deltaH), new
      Point(value.Right + deltaW, value.Bottom + deltaH));
00152 
00153                 SetValue(DisplayAreaProperty, newDispArea);
00154             }
00155         }
00156 
00157         /// <summary>
00158         /// Defines the <see cref="ZoomIncrement"/> property.
00159         /// </summary>
00160         public static readonly StyledProperty<double> ZoomIncrementProperty =
      AvaloniaProperty.Register<PDFRenderer, double>(nameof(ZoomIncrement), Math.Pow(2, 1.0 / 3.0),
      defaultBindingMode: Avalonia.Data.BindingMode.TwoWay);
00161         /// <summary>
00162         /// Determines by how much the scale will be increased/decreased by the <see
      cref="ZoomStep(double, Point?)"/> method. Set this to a value smaller than 1 to invert the zoom
      in/out direction.
00163         /// </summary>
00164         public double ZoomIncrement
00165         {
00166             get { return GetValue(ZoomIncrementProperty); }
00167 
00168             set
00169             {
00170                 if (value <= 0)
00171                 {
00172                     throw new ArgumentOutOfRangeException(nameof(ZoomIncrement), value, "The
      ZoomIncrement must be greater than 0!");
00173                 }
00174 
00175                 SetValue(ZoomIncrementProperty, value);
00176             }
00177         }
00178 
00179         /// <summary>
00180         /// Defines the <see cref="Background"/> property.
00181         /// </summary>
00182         public static readonly StyledProperty<IBrush> BackgroundProperty =
      AvaloniaProperty.Register<PDFRenderer, IBrush>(nameof(Background));
00183         /// <summary>
00184         /// The background colour of the control.
00185         /// </summary>
00186         public IBrush Background
00187         {
00188             get { return GetValue(BackgroundProperty); }
00189             set { SetValue(BackgroundProperty, value); }
00190         }
00191 
00192         /// <summary>
00193         /// Defines the <see cref="PageBackground"/> property.
00194         /// </summary>
00195         public static readonly StyledProperty<IBrush> PageBackgroundProperty =
      AvaloniaProperty.Register<PDFRenderer, IBrush>(nameof(PageBackground));
00196         /// <summary>
00197         /// The background colour to use for the page drawn by the control.
00198         /// </summary>
00199         public IBrush PageBackground
00200         {
00201             get { return GetValue(PageBackgroundProperty); }
00202             set { SetValue(PageBackgroundProperty, value); }
00203         }
00204 
00205         /// <summary>
00206         /// Defines the <see cref="Zoom"/> property.
00207         /// </summary>
00208         public static readonly DirectProperty<PDFRenderer, double> ZoomProperty =
      AvaloniaProperty.RegisterDirect<PDFRenderer, double>(nameof(Zoom), o => o.Zoom, (o, v) => o.Zoom = v,
      defaultBindingMode: Avalonia.Data.BindingMode.TwoWay);
00209         /// <summary>
00210         /// Backing field for the <see cref="Zoom"/> property.
00211         /// </summary>
00212         private double _Zoom;
00213         /// <summary>
00214         /// The current zoom level. Setting this will change the <see cref="DisplayArea"/>
      appropriately, zooming around the center of the <see cref="DisplayArea"/>.
00215         /// </summary>
00216         public double Zoom
```

```
00217         {
00218             get
00219             {
00220                 return _Zoom;
00221             }
00222 
00223             set
00224             {
00225                 double actualZoom = value / _Zoom;
00226 
00227                 double currZoomX = FixedArea.Width / DisplayArea.Width * actualZoom;
00228                 double currZoomY = FixedArea.Height / DisplayArea.Height * actualZoom;
00229 
00230                 double currWidth = FixedArea.Width / currZoomX;
00231                 double currHeight = FixedArea.Height / currZoomY;
00232 
00233 
00234                 Point pos = new Point(this.Bounds.Width * 0.5, this.Bounds.Height * 0.5);
00235 
00236                 double deltaW = currWidth - DisplayArea.Width;
00237                 double deltaH = currHeight - DisplayArea.Height;
00238 
00239                 SetValue(DisplayAreaProperty, new Rect(new Point(DisplayArea.X - deltaW * pos.X /
    this.Bounds.Width, DisplayArea.Y - deltaH * pos.Y / this.Bounds.Height), new Point(DisplayArea.Right
    + deltaW * (1 - pos.X / this.Bounds.Width), DisplayArea.Bottom + deltaH * (1 - pos.Y /
    this.Bounds.Height))));
00240             }
00241         }
00242 
00243         /// <summary>
00244         /// Identifies the action to perform on pointer events.
00245         /// </summary>
00246         public enum PointerEventHandlers
00247         {
00248             /// <summary>
00249             /// Pointer events will be used to pan around the page.
00250             /// </summary>
00251             Pan,
00252 
00253             /// <summary>
00254             /// Pointer events will be used to highlight text.
00255             /// </summary>
00256             Highlight,
00257 
00258             /// <summary>
00259             /// Pointer events will be used to pan around the page or to highlight text, depending on
    where they start.
00260             /// </summary>
00261             PanHighlight,
00262 
00263             /// <summary>
00264             /// Pointer events will be ignored. If you use this value, you will have to implement your
    own way to pan around the document by changing the <see cref="DisplayArea"/> or to select text.
00265             /// </summary>
00266             Custom
00267         }
00268 
00269         /// <summary>
00270         /// Defines the <see cref="PointerEventHandlersType"/> property.
00271         /// </summary>
00272         public static readonly StyledProperty<PointerEventHandlers> PointerEventHandlerTypeProperty =
    AvaloniaProperty.Register<PDFRenderer, PointerEventHandlers>(nameof(PointerEventHandlersType),
    PointerEventHandlers.PanHighlight);
00273         /// <summary>
00274         /// Whether the default handlers for pointer events (which are used for panning around the
    page) should be enabled. If this is false, you will have to implement your own way to pan around the
    document by changing the <see cref="DisplayArea"/>.
00275         /// </summary>
00276         public PointerEventHandlers PointerEventHandlersType
00277         {
00278             get { return GetValue(PointerEventHandlerTypeProperty); }
00279             set { SetValue(PointerEventHandlerTypeProperty, value); }
00280         }
00281 
00282         /// <summary>
00283         /// Defines the <see cref="ZoomEnabled"/> property.
00284         /// </summary>
00285         public static readonly StyledProperty<bool> ZoomEnabledProperty =
    AvaloniaProperty.Register<PDFRenderer, bool>(nameof(ZoomEnabled), true);
00286         /// <summary>
00287         /// Whether the default handlers for pointer wheel events (which are used for zooming in/out)
    should be enabled. If this is false, you will have to implement your own way to zoom by changing the
    <see cref="DisplayArea"/>.
00288         /// </summary>
00289         public bool ZoomEnabled
00290         {
00291             get { return GetValue(ZoomEnabledProperty); }
```

```
00292             set { SetValue(ZoomEnabledProperty, value); }
00293         }
00294
00295         /// <summary>
00296         /// Defines the <see cref="Selection"/> property.
00297         /// </summary>
00298         public static readonly StyledProperty<MuPDFStructuredTextAddressSpan> SelectionProperty =
      AvaloniaProperty.Register<PDFRenderer, MuPDFStructuredTextAddressSpan>(nameof(Selection), null);
00299         /// <summary>
00300         /// The start and end of the currently selected text.
00301         /// </summary>
00302         public MuPDFStructuredTextAddressSpan Selection
00303         {
00304             get { return GetValue(SelectionProperty); }
00305             set { SetValue(SelectionProperty, value); }
00306         }
00307
00308         /// <summary>
00309         /// Defines the <see cref="SelectionBrush"/> property.
00310         /// </summary>
00311         public static readonly StyledProperty<IBrush> SelectionBrushProperty =
      AvaloniaProperty.Register<PDFRenderer, IBrush>(nameof(SelectionBrush), new
      SolidColorBrush(Color.FromArgb(96, 86, 180, 233)));
00312         /// <summary>
00313         /// The colour used to highlight the <see cref="Selection"/>.
00314         /// </summary>
00315         public IBrush SelectionBrush
00316         {
00317             get { return GetValue(SelectionBrushProperty); }
00318             set { SetValue(SelectionBrushProperty, value); }
00319         }
00320
00321         /// <summary>
00322         /// Defines the <see cref="HighlightedRegions"/> property.
00323         /// </summary>
00324         public static readonly StyledProperty<IEnumerable<MuPDFStructuredTextAddressSpan»
      HighlightedRegionsProperty = AvaloniaProperty.Register<PDFRenderer,
      IEnumerable<MuPDFStructuredTextAddressSpan»(nameof(HighlightedRegions), null);
00325         /// <summary>
00326         /// A collection of highlighted regions, e.g. as a result of a text search.
00327         /// </summary>
00328         public IEnumerable<MuPDFStructuredTextAddressSpan> HighlightedRegions
00329         {
00330             get { return GetValue(HighlightedRegionsProperty); }
00331             set { SetValue(HighlightedRegionsProperty, value); }
00332         }
00333
00334         /// <summary>
00335         /// Defines the <see cref="HighlightBrush"/> property.
00336         /// </summary>
00337         public static readonly StyledProperty<IBrush> HighlightBrushProperty =
      AvaloniaProperty.Register<PDFRenderer, IBrush>(nameof(HighlightBrush), new
      SolidColorBrush(Color.FromArgb(96, 230, 159, 0)));
00338         /// <summary>
00339         /// The colour used to highlight the <see cref="HighlightedRegions"/>.
00340         /// </summary>
00341         public IBrush HighlightBrush
00342         {
00343             get { return GetValue(HighlightBrushProperty); }
00344             set { SetValue(HighlightBrushProperty, value); }
00345         }
00346     }
00347 }
```

8.3 RectTransition.cs

```
00001 /*
00002     MuPDFCore.MuPDFRenderer - A control to display documents in Avalonia using MuPDFCore.
00003     Copyright (C) 2020  Giorgio Bianchini
00004
00005     This program is free software: you can redistribute it and/or modify
00006     it under the terms of the GNU Affero General Public License as
00007     published by the Free Software Foundation, version 3.
00008
00009     This program is distributed in the hope that it will be useful,
00010     but WITHOUT ANY WARRANTY; without even the implied warranty of
00011     MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.  See the
00012     GNU Affero General Public License for more details.
00013
00014     You should have received a copy of the GNU Affero General Public License
00015     along with this program.  If not, see <http://www.gnu.org/licenses/>
00016 */
00017
```

```
00018 using System;
00019 using System.Reactive.Linq;
00020
00021 namespace Avalonia.Animation
00022 {
00023     /// <summary>
00024     /// Transition class that handles <see cref="AvaloniaProperty"/> with <see cref="Rect"/> types.
00025     /// </summary>
00026     public class RectTransition : Transition<Rect>
00027     {
00028         /// <inheritdoc/>
00029         public override IObservable<Rect> DoTransition(IObservable<double> progress, Rect oldValue,
      Rect newValue)
00030         {
00031             return progress
00032                 .Select(p =>
00033                 {
00034                     var f = Easing.Ease(p);
00035
00036                     return new Rect((newValue.X - oldValue.X) * f + oldValue.X,
00037                         (newValue.Y - oldValue.Y) * f + oldValue.Y,
00038                         (newValue.Width - oldValue.Width) * f + oldValue.Width,
00039                         (newValue.Height - oldValue.Height) * f + oldValue.Height);
00040                 });
00041         }
00042     }
00043 }
```

8.4 MuPDF.cs

```
00001 /*
00002     MuPDFCore - A set of multiplatform .NET Core bindings for MuPDF.
00003     Copyright (C) 2020  Giorgio Bianchini
00004
00005     This program is free software: you can redistribute it and/or modify
00006     it under the terms of the GNU Affero General Public License as
00007     published by the Free Software Foundation, version 3.
00008
00009     This program is distributed in the hope that it will be useful,
00010     but WITHOUT ANY WARRANTY; without even the implied warranty of
00011     MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.  See the
00012     GNU Affero General Public License for more details.
00013
00014     You should have received a copy of the GNU Affero General Public License
00015     along with this program.  If not, see <http://www.gnu.org/licenses/>
00016 */
00017
00018 using System;
00019 using System.IO;
00020 using System.IO.Pipes;
00021 using System.Runtime.InteropServices;
00022 using System.Text;
00023 using System.Threading.Tasks;
00024
00025 [assembly: System.Runtime.CompilerServices.InternalsVisibleTo("Tests")]
00026 namespace MuPDFCore
00027 {
00028     /// <summary>
00029     /// Exit codes returned by native methods describing various errors that can occur.
00030     /// </summary>
00031     public enum ExitCodes
00032     {
00033         /// <summary>
00034         /// An error occurred while creating the context object.
00035         /// </summary>
00036         ERR_CANNOT_CREATE_CONTEXT = 129,
00037
00038         /// <summary>
00039         /// An error occurred while registering the default document handlers with the context.
00040         /// </summary>
00041         ERR_CANNOT_REGISTER_HANDLERS = 130,
00042
00043         /// <summary>
00044         /// An error occurred while opening a file.
00045         /// </summary>
00046         ERR_CANNOT_OPEN_FILE = 131,
00047
00048         /// <summary>
00049         /// An error occurred while determining the total number of pages in the document.
00050         /// </summary>
00051         ERR_CANNOT_COUNT_PAGES = 132,
00052
00053         /// <summary>
```

```
00054         /// An error occurred while rendering the page.
00055         /// </summary>
00056         ERR_CANNOT_RENDER = 134,
00057 
00058         /// <summary>
00059         /// An error occurred while opening the stream.
00060         /// </summary>
00061         ERR_CANNOT_OPEN_STREAM = 135,
00062 
00063         /// <summary>
00064         /// An error occurred while loading the page.
00065         /// </summary>
00066         ERR_CANNOT_LOAD_PAGE = 136,
00067 
00068         /// <summary>
00069         /// An error occurred while computing the page bounds.
00070         /// </summary>
00071         ERR_CANNOT_COMPUTE_BOUNDS = 137,
00072 
00073         /// <summary>
00074         /// An error occurred while initialising the mutexes for the lock mechanism.
00075         /// </summary>
00076         ERR_CANNOT_INIT_MUTEX = 138,
00077 
00078         /// <summary>
00079         /// An error occurred while cloning the context.
00080         /// </summary>
00081         ERR_CANNOT_CLONE_CONTEXT = 139,
00082 
00083         /// <summary>
00084         /// An error occurred while saving the page to a raster image file.
00085         /// </summary>
00086         ERR_CANNOT_SAVE = 140,
00087 
00088         /// <summary>
00089         /// An error occurred while creating the output buffer.
00090         /// </summary>
00091         ERR_CANNOT_CREATE_BUFFER = 141,
00092 
00093         /// <summary>
00094         /// An error occurred while creating the document writer.
00095         /// </summary>
00096         ERR_CANNOT_CREATE_WRITER = 142,
00097 
00098         /// <summary>
00099         /// An error occurred while finalising the document file.
00100         /// </summary>
00101         ERR_CANNOT_CLOSE_DOCUMENT = 143,
00102 
00103         /// <summary>
00104         /// An error occurred while creating an empty structured text page.
00105         /// </summary>
00106         ERR_CANNOT_CREATE_PAGE = 144,
00107 
00108         /// <summary>
00109         /// An error occurred while populating the structured text page
00110         /// </summary>
00111         ERR_CANNOT_POPULATE_PAGE = 145,
00112 
00113         /// <summary>
00114         /// No error occurred. All is well.
00115         /// </summary>
00116         EXIT_SUCCESS = 0
00117     }
00118 
00119     /// <summary>
00120     /// File types supported in input by the library.
00121     /// </summary>
00122     public enum InputFileTypes
00123     {
00124         /// <summary>
00125         /// Portable Document Format.
00126         /// </summary>
00127         PDF = 0,
00128 
00129         /// <summary>
00130         /// XML Paper Specification document.
00131         /// </summary>
00132         XPS = 1,
00133 
00134         /// <summary>
00135         /// Comic book archive file (ZIP archive containing page scans).
00136         /// </summary>
00137         CBZ = 2,
00138 
00139         /// <summary>
00140         /// Portable Network Graphics format.
```

```
00141         /// </summary>
00142         PNG = 3,
00143
00144         /// <summary>
00145         /// Joint Photographic Experts Group image.
00146         /// </summary>
00147         JPEG = 4,
00148
00149         /// <summary>
00150         /// Bitmap image.
00151         /// </summary>
00152         BMP = 5,
00153
00154         /// <summary>
00155         /// Graphics Interchange Format.
00156         /// </summary>
00157         GIF = 6,
00158
00159         /// <summary>
00160         /// Tagged Image File Format.
00161         /// </summary>
00162         TIFF = 7,
00163
00164         /// <summary>
00165         /// Portable aNyMap graphics format.
00166         /// </summary>
00167         PNM = 8,
00168
00169         /// <summary>
00170         /// Portable Arbitrary Map graphics format.
00171         /// </summary>
00172         PAM = 9,
00173
00174         /// <summary>
00175         /// Electronic PUBlication document.
00176         /// </summary>
00177         EPUB = 10,
00178
00179         /// <summary>
00180         /// FictionBook document.
00181         /// </summary>
00182         FB2 = 11
00183     }
00184
00185     /// <summary>
00186     /// Raster image file types supported in output by the library.
00187     /// </summary>
00188     public enum RasterOutputFileTypes
00189     {
00190         /// <summary>
00191         /// Portable aNyMap graphics format.
00192         /// </summary>
00193         PNM = 0,
00194
00195         /// <summary>
00196         /// Portable Arbitrary Map graphics format.
00197         /// </summary>
00198         PAM = 1,
00199
00200         /// <summary>
00201         /// Portable Network Graphics format.
00202         /// </summary>
00203         PNG = 2,
00204
00205         /// <summary>
00206         /// PhotoShop Document format.
00207         /// </summary>
00208         PSD = 3
00209     };
00210
00211     /// <summary>
00212     /// Document file types supported in output by the library.
00213     /// </summary>
00214     public enum DocumentOutputFileTypes
00215     {
00216         /// <summary>
00217         /// Portable Document Format.
00218         /// </summary>
00219         PDF = 0,
00220
00221         /// <summary>
00222         /// Scalable Vector Graphics.
00223         /// </summary>
00224         SVG = 1,
00225
00226         /// <summary>
00227         /// Comic book archive format.
```

```
00228         /// </summary>
00229         CBZ = 2
00230     };
00231 
00232     /// <summary>
00233     /// Pixel formats supported by the library.
00234     /// </summary>
00235     public enum PixelFormats
00236     {
00237         /// <summary>
00238         /// 24bpp RGB format.
00239         /// </summary>
00240         RGB = 0,
00241 
00242         /// <summary>
00243         /// 32bpp RGBA format.
00244         /// </summary>
00245         RGBA = 1,
00246 
00247         /// <summary>
00248         /// 24bpp BGR format.
00249         /// </summary>
00250         BGR = 2,
00251 
00252         /// <summary>
00253         /// 32bpp BGRA format.
00254         /// </summary>
00255         BGRA = 3
00256     }
00257 
00258     /// <summary>
00259     /// Possible document encryption states.
00260     /// </summary>
00261     public enum EncryptionState
00262     {
00263         /// <summary>
00264         /// The document is not encrypted.
00265         /// </summary>
00266         Unencrypted = 0,
00267 
00268         /// <summary>
00269         /// The document is encrypted and a user password is necessary to render it.
00270         /// </summary>
00271         Encrypted = 1,
00272 
00273         /// <summary>
00274         /// The document is encrypted and the correct user password has been supplied.
00275         /// </summary>
00276         Unlocked = 2
00277     }
00278 
00279     /// <summary>
00280     /// Possible document restriction states.
00281     /// </summary>
00282     public enum RestrictionState
00283     {
00284         /// <summary>
00285         /// The document does not have any restrictions associated to it.
00286         /// </summary>
00287         Unrestricted = 0,
00288 
00289         /// <summary>
00290         /// Some restrictions apply to the document. An owner password is required to remove these
      restrictions.
00291         /// </summary>
00292         Restricted = 1,
00293 
00294         /// <summary>
00295         /// The document had some restrictions and the correct owner password has been supplied.
00296         /// </summary>
00297         Unlocked = 2
00298     }
00299 
00300     /// <summary>
00301     /// Document restrictions.
00302     /// </summary>
00303     public enum DocumentRestrictions
00304     {
00305         /// <summary>
00306         /// No operation is restricted.
00307         /// </summary>
00308         None = 0,
00309 
00310         /// <summary>
00311         /// Printing the document is restricted.
00312         /// </summary>
00313         Print = 1,
```

```
00314
00315         /// <summary>
00316         /// Copying the document is restricted.
00317         /// </summary>
00318         Copy = 2,
00319
00320         /// <summary>
00321         /// Editing the document is restricted.
00322         /// </summary>
00323         Edit = 4,
00324
00325         /// <summary>
00326         /// Annotating the document is restricted.
00327         /// </summary>
00328         Annotate = 8
00329     }
00330
00331     /// <summary>
00332     /// Password types.
00333     /// </summary>
00334     public enum PasswordTypes
00335     {
00336         /// <summary>
00337         /// No password.
00338         /// </summary>
00339         None = 0,
00340
00341         /// <summary>
00342         /// The password corresponds to the user password.
00343         /// </summary>
00344         User = 1,
00345
00346         /// <summary>
00347         /// The password corresponds to the owner password.
00348         /// </summary>
00349         Owner = 2
00350     }
00351
00352     /// <summary>
00353     /// A struct to hold information about the current rendering process and to abort rendering as
      needed.
00354     /// </summary>
00355     [StructLayout(LayoutKind.Sequential)]
00356     internal struct Cookie
00357     {
00358         public int abort;
00359         public int progress;
00360         public ulong progress_max;
00361         public int errors;
00362         public int incomplete;
00363     }
00364
00365     /// <summary>
00366     /// Holds a summary of the progress of the current rendering operation.
00367     /// </summary>
00368     public class RenderProgress
00369     {
00370         /// <summary>
00371         /// Holds the progress of a single thread.
00372         /// </summary>
00373         public struct ThreadRenderProgress
00374         {
00375             /// <summary>
00376             /// The current progress.
00377             /// </summary>
00378             public int Progress;
00379
00380             /// <summary>
00381             /// The maximum progress. If this is 0, this value could not be determined (yet).
00382             /// </summary>
00383             public long MaxProgress;
00384
00385             internal ThreadRenderProgress(int progress, ulong maxProgress)
00386             {
00387                 this.Progress = progress;
00388                 this.MaxProgress = (long)maxProgress;
00389             }
00390         }
00391
00392         /// <summary>
00393         /// Contains the progress of all the threads used in rendering the document.
00394         /// </summary>
00395         public ThreadRenderProgress[] ThreadRenderProgresses { get; private set; }
00396
00397         internal RenderProgress(ThreadRenderProgress[] threadRenderProgresses)
00398         {
00399             ThreadRenderProgresses = threadRenderProgresses;
```

```
00400         }
00401     }
00402
00403     /// <summary>
00404     /// An <see cref="IDisposable"/> wrapper around an <see cref="IntPtr"/> that frees the allocated
      memory when it is disposed.
00405     /// </summary>
00406     public class DisposableIntPtr : IDisposable
00407     {
00408         /// <summary>
00409         /// The pointer to the unmanaged memory.
00410         /// </summary>
00411         private readonly IntPtr InternalPointer;
00412
00413         /// <summary>
00414         /// The number of bytes that have been allocated, for adding memory pressure.
00415         /// </summary>
00416         private readonly long BytesAllocated = -1;
00417
00418         /// <summary>
00419         /// Create a new DisposableIntPtr.
00420         /// </summary>
00421         /// <param name="pointer">The pointer that should be freed upon disposing of this
      object.</param>
00422         public DisposableIntPtr(IntPtr pointer)
00423         {
00424             this.InternalPointer = pointer;
00425         }
00426
00427         /// <summary>
00428         /// Create a new DisposableIntPtr, adding memory pressure to the GC to account for the
      allocation of unmanaged memory.
00429         /// </summary>
00430         /// <param name="pointer">The pointer that should be freed upon disposing of this
      object.</param>
00431         /// <param name="bytesAllocated">The number of bytes that have been allocated, for adding
      memory pressure.</param>
00432         public DisposableIntPtr(IntPtr pointer, long bytesAllocated)
00433         {
00434             this.InternalPointer = pointer;
00435             this.BytesAllocated = bytesAllocated;
00436
00437             if (BytesAllocated > 0)
00438             {
00439                 GC.AddMemoryPressure(bytesAllocated);
00440             }
00441         }
00442
00443         private bool disposedValue;
00444
00445         ///<inheritdoc/>
00446         protected virtual void Dispose(bool disposing)
00447         {
00448             if (!disposedValue)
00449             {
00450                 Marshal.FreeHGlobal(InternalPointer);
00451
00452                 if (BytesAllocated > 0)
00453                 {
00454                     GC.RemoveMemoryPressure(BytesAllocated);
00455                 }
00456
00457                 disposedValue = true;
00458             }
00459         }
00460
00461         ///<inheritdoc/>
00462         ~DisposableIntPtr()
00463         {
00464             Dispose(disposing: false);
00465         }
00466
00467         ///<inheritdoc/>
00468         public void Dispose()
00469         {
00470             Dispose(disposing: true);
00471             GC.SuppressFinalize(this);
00472         }
00473     }
00474
00475     /// <summary>
00476     /// The exception that is thrown when a MuPDF operation fails.
00477     /// </summary>
00478     public class MuPDFException : Exception
00479     {
00480         /// <summary>
00481         /// The <see cref="ExitCodes"/> returned by the native function.
```

```
00482         /// </summary>
00483         public readonly ExitCodes ErrorCode;
00484
00485         internal MuPDFException(string message, ExitCodes errorCode) : base(message)
00486         {
00487             this.ErrorCode = errorCode;
00488         }
00489     }
00490
00491     /// <summary>
00492     /// The exception that is thrown when an attempt is made to render an encrypted document without
      supplying the required password.
00493     /// </summary>
00494     public class DocumentLockedException : Exception
00495     {
00496         internal DocumentLockedException(string message) : base(message) { }
00497     }
00498
00499     /// <summary>
00500     /// A class to simplify passing a string to the MuPDF C library with the correct encoding.
00501     /// </summary>
00502     internal class UTF8EncodedString : IDisposable
00503     {
00504         private bool disposedValue;
00505
00506         /// <summary>
00507         /// The address of the bytes encoding the string in unmanaged memory.
00508         /// </summary>
00509         public IntPtr Address { get; }
00510
00511         /// <summary>
00512         /// Create a null-terminated, UTF-8 encoded string in unmanaged memory.
00513         /// </summary>
00514         /// <param name="text"></param>
00515         public UTF8EncodedString(string text)
00516         {
00517             byte[] data = System.Text.Encoding.UTF8.GetBytes(text);
00518
00519             IntPtr dataHolder = Marshal.AllocHGlobal(data.Length + 1);
00520             Marshal.Copy(data, 0, dataHolder, data.Length);
00521             Marshal.WriteByte(dataHolder, data.Length, 0);
00522
00523             this.Address = dataHolder;
00524         }
00525
00526         protected virtual void Dispose(bool disposing)
00527         {
00528             if (!disposedValue)
00529             {
00530                 Marshal.FreeHGlobal(Address);
00531                 disposedValue = true;
00532             }
00533         }
00534
00535         ~UTF8EncodedString()
00536         {
00537             Dispose(disposing: false);
00538         }
00539
00540         public void Dispose()
00541         {
00542             Dispose(disposing: true);
00543             GC.SuppressFinalize(this);
00544         }
00545     }
00546
00547     /// <summary>
00548     /// EventArgs for the <see cref="MuPDF.StandardOutputMessage"/> and <see
      cref="MuPDF.StandardErrorMessage"/> events.
00549     /// </summary>
00550     public class MessageEventArgs : EventArgs
00551     {
00552         /// <summary>
00553         /// The message that has been logged.
00554         /// </summary>
00555         public string Message { get; }
00556
00557         /// <summary>
00558         /// Create a new <see cref="MessageEventArgs"/> instance.
00559         /// </summary>
00560         /// <param name="message">The message that has been logged.</param>
00561         public MessageEventArgs(string message)
00562         {
00563             this.Message = message;
00564         }
00565     }
00566
```

```
00567     /// <summary>
00568     /// Contains static methods to perform setup operations.
00569     /// </summary>
00570     public static class MuPDF
00571     {
00572         private static int StdOutFD = -1;
00573         private static int StdErrFD = -1;
00574 
00575         private static TextWriter ConsoleOut;
00576         private static TextWriter ConsoleErr;
00577 
00578         private static ConsoleColor DefaultForeground;
00579         private static ConsoleColor DefaultBackground;
00580 
00581         private static string PipeName;
00582         private static bool CleanupRegistered = false;
00583         private static object CleanupLock = new object();
00584 
00585         /// <summary>
00586         /// This event is invoked when <see cref="RedirectOutput"/> has been called and the native
      MuPDF library writes to the standard output stream.
00587         /// </summary>
00588         public static event EventHandler<MessageEventArgs> StandardOutputMessage;
00589 
00590         /// <summary>
00591         /// This event is invoked when <see cref="RedirectOutput"/> has been called and the native
      MuPDF library writes to the standard error stream.
00592         /// </summary>
00593         public static event EventHandler<MessageEventArgs> StandardErrorMessage;
00594 
00595         /// <summary>
00596         /// Redirects output messages from the native MuPDF library to the <see
      cref="StandardOutputMessage"/> and <see cref="StandardErrorMessage"/> events. Note that this has
      side-effects.
00597         /// </summary>
00598         /// <returns>A <see cref="Task"/> that finishes when the output streams have been
      redirected.</returns>
00599         public static async Task RedirectOutput()
00600         {
00601             if
      (System.Runtime.InteropServices.RuntimeInformation.IsOSPlatform(System.Runtime.InteropServices.OSPlatform.Windows))
00602             {
00603                 await RedirectOutputWindows();
00604             }
00605             else
00606             {
00607                 await RedirectOutputUnix();
00608             }
00609 
00610             if (!CleanupRegistered)
00611             {
00612                 AppDomain.CurrentDomain.ProcessExit += (s, e) =>
00613                 {
00614                     ResetOutput();
00615                 };
00616             }
00617         }
00618 
00619         const int UnixMaxPipeLength = 107;
00620 
00621         private static async Task RedirectOutputUnix()
00622         {
00623             if (StdOutFD < 0 && StdErrFD < 0)
00624             {
00625                 string tempPath = Path.GetTempPath();
00626 
00627                 string pipeName = "MuPDFCore-" + Guid.NewGuid().ToString();
00628 
00629                 pipeName = pipeName.Substring(0, Math.Min(pipeName.Length, UnixMaxPipeLength -
      tempPath.Length - 4));
00630                 pipeName = Path.Combine(tempPath, pipeName);
00631 
00632                 PipeName = pipeName;
00633 
00634                 Task redirectOutputTask = System.Threading.Tasks.Task.Run(() =>
00635                 {
00636                     NativeMethods.RedirectOutput(out StdOutFD, out StdErrFD, pipeName + "-out",
      pipeName + "-err");
00637                 });
00638 
00639                 // Start stdout pipe (this is actually a socket)
00640                 _ = Task.Run(() =>
00641                 {
00642                     using (NamedPipeClientStream client = new NamedPipeClientStream(pipeName +
      "-out"))
00643                     {
00644                         while (true)
```

```
00645                         {
00646                             try
00647                             {
00648                                 client.Connect(100);
00649                                 break;
00650                             }
00651                             catch { }
00652                         }
00653 
00654                         using (StreamReader reader = new StreamReader(client))
00655                         {
00656                             while (true)
00657                             {
00658                                 string message = reader.ReadLine();
00659 
00660                                 if (!string.IsNullOrEmpty(message))
00661                                 {
00662                                     StandardOutputMessage?.Invoke(null, new
      MessageEventArgs(message));
00663                                 }
00664                             }
00665                         }
00666                     }
00667 
00668                 });
00669 
00670                 // Start stderr pipe (this is actually a socket)
00671                 _ = Task.Run(() =>
00672                 {
00673                     using (NamedPipeClientStream client = new NamedPipeClientStream(pipeName +
      "-err"))
00674                     {
00675                         while (true)
00676                         {
00677                             try
00678                             {
00679                                 client.Connect(100);
00680                                 break;
00681                             }
00682                             catch { }
00683                         }
00684 
00685                         using (StreamReader reader = new StreamReader(client))
00686                         {
00687                             while (true)
00688                             {
00689                                 string message = reader.ReadLine();
00690 
00691                                 if (!string.IsNullOrEmpty(message))
00692                                 {
00693                                     StandardErrorMessage?.Invoke(null, new MessageEventArgs(message));
00694                                 }
00695                             }
00696                         }
00697                     }
00698 
00699                 });
00700 
00701                 await redirectOutputTask;
00702 
00703                 ConsoleOut = Console.Out;
00704                 ConsoleErr = Console.Error;
00705 
00706                 ConsoleColor fg = Console.ForegroundColor;
00707                 ConsoleColor bg = Console.BackgroundColor;
00708 
00709                 Console.ResetColor();
00710 
00711                 DefaultForeground = Console.ForegroundColor;
00712                 DefaultBackground = Console.BackgroundColor;
00713 
00714                 Console.ForegroundColor = fg;
00715                 Console.BackgroundColor = bg;
00716 
00717                 Console.SetOut(new FileDescriptorTextWriter(Console.Out.Encoding, StdOutFD));
00718                 Console.SetError(new FileDescriptorTextWriter(Console.Error.Encoding, StdErrFD));
00719             }
00720         }
00721 
00722         private static async Task RedirectOutputWindows()
00723         {
00724             if (StdOutFD < 0 && StdErrFD < 0)
00725             {
00726                 string pipeName = "MuPDFCore-" + Guid.NewGuid().ToString();
00727 
00728                 Task redirectOutputTask = System.Threading.Tasks.Task.Run(() =>
00729                 {
```

```
00730                     NativeMethods.RedirectOutput(out StdOutFD, out StdErrFD, "\\\\.\\pipe\\" +
    pipeName + "-out", "\\\\.\\pipe\\" + pipeName + "-err");
00731                 });
00732
00733                 // Start stdout pipe
00734                 _ = Task.Run(() =>
00735                 {
00736                     using (NamedPipeClientStream client = new NamedPipeClientStream(pipeName +
    "-out"))
00737                     {
00738                         while (true)
00739                         {
00740                             try
00741                             {
00742                                 client.Connect(100);
00743                                 break;
00744                             }
00745                             catch { }
00746                         }
00747
00748                         using (StreamReader reader = new StreamReader(client))
00749                         {
00750                             while (true)
00751                             {
00752                                 string message = reader.ReadLine();
00753
00754                                 if (!string.IsNullOrEmpty(message))
00755                                 {
00756                                     StandardOutputMessage?.Invoke(null, new
    MessageEventArgs(message));
00757                                 }
00758                             }
00759                         }
00760                     }
00761
00762                 });
00763
00764                 // Start stderr pipe
00765                 _ = Task.Run(() =>
00766                 {
00767                     using (NamedPipeClientStream client = new NamedPipeClientStream(pipeName +
    "-err"))
00768                     {
00769                         while (true)
00770                         {
00771                             try
00772                             {
00773                                 client.Connect(100);
00774                                 break;
00775                             }
00776                             catch { }
00777                         }
00778
00779                         using (StreamReader reader = new StreamReader(client))
00780                         {
00781                             while (true)
00782                             {
00783                                 string message = reader.ReadLine();
00784
00785                                 if (!string.IsNullOrEmpty(message))
00786                                 {
00787                                     StandardErrorMessage?.Invoke(null, new MessageEventArgs(message));
00788                                 }
00789                             }
00790                         }
00791                     }
00792
00793                 });
00794
00795                 await redirectOutputTask;
00796
00797                 ConsoleOut = Console.Out;
00798                 ConsoleErr = Console.Error;
00799
00800                 ConsoleColor fg = Console.ForegroundColor;
00801                 ConsoleColor bg = Console.BackgroundColor;
00802
00803                 Console.ResetColor();
00804
00805                 DefaultForeground = Console.ForegroundColor;
00806                 DefaultBackground = Console.BackgroundColor;
00807
00808                 Console.ForegroundColor = fg;
00809                 Console.BackgroundColor = bg;
00810
00811                 Console.SetOut(new FileDescriptorTextWriter(Console.Out.Encoding, StdOutFD));
00812                 Console.SetError(new FileDescriptorTextWriter(Console.Error.Encoding, StdErrFD));
```

```
00813             }
00814         }
00815 
00816         /// <summary>
00817         /// Reset the default standard output and error streams for the native MuPDF library.
00818         /// </summary>
00819         public static void ResetOutput()
00820         {
00821             lock (CleanupLock)
00822             {
00823                 if (StdOutFD >= 0 && StdErrFD >= 0)
00824                 {
00825                     NativeMethods.ResetOutput(StdOutFD, StdErrFD);
00826 
00827                     Console.SetOut(ConsoleOut);
00828                     Console.SetError(ConsoleErr);
00829 
00830                     StdOutFD = -1;
00831                     StdErrFD = -1;
00832 
00833                     if
      (!System.Runtime.InteropServices.RuntimeInformation.IsOSPlatform(OSPlatform.Windows))
00834                     {
00835                         File.Delete(PipeName + "-out");
00836                         File.Delete(PipeName + "-err");
00837                     }
00838                 }
00839             }
00840         }
00841 
00842         internal class FileDescriptorTextWriter : TextWriter
00843         {
00844             public override Encoding Encoding { get; }
00845             private int FileDescriptor { get; }
00846 
00847             public FileDescriptorTextWriter(Encoding encoding, int fileDescriptor)
00848             {
00849                 this.Encoding = encoding;
00850                 this.FileDescriptor = fileDescriptor;
00851             }
00852 
00853             public override void Write(string value)
00854             {
00855                 StringBuilder sb = new StringBuilder();
00856 
00857                 if (Console.ForegroundColor != DefaultForeground || Console.BackgroundColor !=
      DefaultBackground)
00858                 {
00859                     sb.Append(" [");
00860                 }
00861 
00862                 if (Console.ForegroundColor != DefaultForeground)
00863                 {
00864                     switch (Console.ForegroundColor)
00865                     {
00866                         case ConsoleColor.Black:
00867                             sb.Append("30");
00868                             break;
00869                         case ConsoleColor.DarkRed:
00870                             sb.Append("31");
00871                             break;
00872                         case ConsoleColor.DarkGreen:
00873                             sb.Append("32");
00874                             break;
00875                         case ConsoleColor.DarkYellow:
00876                             sb.Append("33");
00877                             break;
00878                         case ConsoleColor.DarkBlue:
00879                             sb.Append("34");
00880                             break;
00881                         case ConsoleColor.DarkMagenta:
00882                             sb.Append("35");
00883                             break;
00884                         case ConsoleColor.DarkCyan:
00885                             sb.Append("36");
00886                             break;
00887                         case ConsoleColor.Gray:
00888                             sb.Append("37");
00889                             break;
00890                         case ConsoleColor.DarkGray:
00891                             sb.Append("90");
00892                             break;
00893                         case ConsoleColor.Red:
00894                             sb.Append("91");
00895                             break;
00896                         case ConsoleColor.Green:
00897                             sb.Append("92");
```

```
00898                           break;
00899                       case ConsoleColor.Yellow:
00900                           sb.Append("93");
00901                           break;
00902                       case ConsoleColor.Blue:
00903                           sb.Append("94");
00904                           break;
00905                       case ConsoleColor.Magenta:
00906                           sb.Append("95");
00907                           break;
00908                       case ConsoleColor.Cyan:
00909                           sb.Append("96");
00910                           break;
00911                       case ConsoleColor.White:
00912                           sb.Append("97");
00913                           break;
00914                   }
00915               }
00916
00917               if (Console.ForegroundColor != DefaultForeground && Console.BackgroundColor !=
      DefaultBackground)
00918               {
00919                   sb.Append(";");
00920               }
00921
00922               if (Console.BackgroundColor != DefaultBackground)
00923               {
00924                   switch (Console.BackgroundColor)
00925                   {
00926                       case ConsoleColor.Black:
00927                           sb.Append("40");
00928                           break;
00929                       case ConsoleColor.DarkRed:
00930                           sb.Append("41");
00931                           break;
00932                       case ConsoleColor.DarkGreen:
00933                           sb.Append("42");
00934                           break;
00935                       case ConsoleColor.DarkYellow:
00936                           sb.Append("43");
00937                           break;
00938                       case ConsoleColor.DarkBlue:
00939                           sb.Append("44");
00940                           break;
00941                       case ConsoleColor.DarkMagenta:
00942                           sb.Append("45");
00943                           break;
00944                       case ConsoleColor.DarkCyan:
00945                           sb.Append("46");
00946                           break;
00947                       case ConsoleColor.Gray:
00948                           sb.Append("47");
00949                           break;
00950                       case ConsoleColor.DarkGray:
00951                           sb.Append("100");
00952                           break;
00953                       case ConsoleColor.Red:
00954                           sb.Append("101");
00955                           break;
00956                       case ConsoleColor.Green:
00957                           sb.Append("102");
00958                           break;
00959                       case ConsoleColor.Yellow:
00960                           sb.Append("103");
00961                           break;
00962                       case ConsoleColor.Blue:
00963                           sb.Append("104");
00964                           break;
00965                       case ConsoleColor.Magenta:
00966                           sb.Append("105");
00967                           break;
00968                       case ConsoleColor.Cyan:
00969                           sb.Append("106");
00970                           break;
00971                       case ConsoleColor.White:
00972                           sb.Append("107");
00973                           break;
00974                   }
00975               }
00976
00977               if (Console.ForegroundColor != DefaultForeground || Console.BackgroundColor !=
      DefaultBackground)
00978               {
00979                   sb.Append("m");
00980               }
00981
00982               sb.Append(value);
```

```
00983
00984                 if (Console.ForegroundColor != DefaultForeground || Console.BackgroundColor !=
      DefaultBackground)
00985                 {
00986                     sb.Append(" [");
00987                 }
00988
00989                 if (Console.ForegroundColor != DefaultForeground)
00990                 {
00991                     sb.Append("39");
00992                 }
00993
00994                 if (Console.ForegroundColor != DefaultForeground && Console.BackgroundColor !=
      DefaultBackground)
00995                 {
00996                     sb.Append(";");
00997                 }
00998
00999                 if (Console.BackgroundColor != DefaultBackground)
01000                 {
01001                     sb.Append("49");
01002                 }
01003
01004                 if (Console.ForegroundColor != DefaultForeground || Console.BackgroundColor !=
      DefaultBackground)
01005                 {
01006                     sb.Append("m");
01007                 }
01008
01009                 NativeMethods.WriteToFileDescriptor(FileDescriptor, sb.ToString(), sb.Length);
01010             }
01011
01012             public override void Write(char value)
01013             {
01014                 Write(value.ToString());
01015             }
01016
01017             public override void Write(char[] buffer)
01018             {
01019                 Write(new string(buffer));
01020             }
01021
01022             public override void Write(char[] buffer, int index, int count)
01023             {
01024                 Write(new string(buffer, index, count));
01025             }
01026
01027             public override void WriteLine(string value)
01028             {
01029                 Write(value);
01030                 WriteLine();
01031             }
01032         }
01033     }
01034
01035     /// <summary>
01036     /// Native methods.
01037     /// </summary>
01038     internal static class NativeMethods
01039     {
01040         /// <summary>
01041         /// Create a MuPDF context object with the specified store size.
01042         /// </summary>
01043         /// <param name="store_size">Maximum size in bytes of the resource store.</param>
01044         /// <param name="out_ctx">A pointer to the native context object.</param>
01045         /// <returns>An integer equivalent to <see cref="ExitCodes"/> detailing whether any errors
      occurred.</returns>
01046         [DllImport("MuPDFWrapper", CallingConvention = CallingConvention.Cdecl)]
01047         internal static extern int CreateContext(ulong store_size, ref IntPtr out_ctx);
01048
01049         /// <summary>
01050         /// Free a context and its global store.
01051         /// </summary>
01052         /// <param name="ctx">A pointer to the native context to free.</param>
01053         /// <returns>An integer equivalent to <see cref="ExitCodes"/> detailing whether any errors
      occurred.</returns>
01054         [DllImport("MuPDFWrapper", CallingConvention = CallingConvention.Cdecl)]
01055         internal static extern int DisposeContext(IntPtr ctx);
01056
01057         /// <summary>
01058         /// Evict items from the store until the total size of the objects in the store is reduced to
      a given percentage of its current size.
01059         /// </summary>
01060         /// <param name="ctx">The context whose store should be shrunk.</param>
01061         /// <param name="perc">Fraction of current size to reduce the store to.</param>
01062         /// <returns>An integer equivalent to <see cref="ExitCodes"/> detailing whether any errors
      occurred.</returns>
```

```
01063         [DllImport("MuPDFWrapper", CallingConvention = CallingConvention.Cdecl)]
01064         internal static extern int ShrinkStore(IntPtr ctx, uint perc);
01065
01066         /// <summary>
01067         /// Evict every item from the store.
01068         /// </summary>
01069         /// <param name="ctx">The context whose store should be emptied.</param>
01070         /// <returns>An integer equivalent to <see cref="ExitCodes"/> detailing whether any errors
      occurred.</returns>
01071         [DllImport("MuPDFWrapper", CallingConvention = CallingConvention.Cdecl)]
01072         internal static extern void EmptyStore(IntPtr ctx);
01073
01074         /// <summary>
01075         /// Get the current size of the store.
01076         /// </summary>
01077         /// <param name="ctx">The context whose store's size should be determined.</param>
01078         /// <returns>The current size in bytes of the store.</returns>
01079         [DllImport("MuPDFWrapper", CallingConvention = CallingConvention.Cdecl)]
01080         internal static extern ulong GetCurrentStoreSize(IntPtr ctx);
01081
01082         /// <summary>
01083         /// Get the maximum size of the store.
01084         /// </summary>
01085         /// <param name="ctx">The context whose store's maximum size should be determined.</param>
01086         /// <returns>The maximum size in bytes of the store.</returns>
01087         [DllImport("MuPDFWrapper", CallingConvention = CallingConvention.Cdecl)]
01088         internal static extern ulong GetMaxStoreSize(IntPtr ctx);
01089
01090         /// <summary>
01091         /// Create a display list from a page.
01092         /// </summary>
01093         /// <param name="ctx">A pointer to the context used to create the document.</param>
01094         /// <param name="page">A pointer to the page that should be used to create the display
      list.</param>
01095         /// <param name="annotations">An integer indicating whether annotations should be included in
      the display list (1) or not (any other value).</param>
01096         /// <param name="out_display_list">A pointer to the newly-created display list.</param>
01097         /// <param name="out_x0">The left coordinate of the display list's bounds.</param>
01098         /// <param name="out_y0">The top coordinate of the display list's bounds.</param>
01099         /// <param name="out_x1">The right coordinate of the display list's bounds.</param>
01100         /// <param name="out_y1">The bottom coordinate of the display list's bounds.</param>
01101         /// <returns>An integer equivalent to <see cref="ExitCodes"/> detailing whether any errors
      occurred.</returns>
01102         [DllImport("MuPDFWrapper", CallingConvention = CallingConvention.Cdecl)]
01103         internal static extern int GetDisplayList(IntPtr ctx, IntPtr page, int annotations, ref IntPtr
      out_display_list, ref float out_x0, ref float out_y0, ref float out_x1, ref float out_y1);
01104
01105         /// <summary>
01106         /// Free a display list.
01107         /// </summary>
01108         /// <param name="ctx">The context that was used to create the display list.</param>
01109         /// <param name="list">The display list to dispose.</param>
01110         /// <returns>An integer equivalent to <see cref="ExitCodes"/> detailing whether any errors
      occurred.</returns>
01111         [DllImport("MuPDFWrapper", CallingConvention = CallingConvention.Cdecl)]
01112         internal static extern int DisposeDisplayList(IntPtr ctx, IntPtr list);
01113
01114         /// <summary>
01115         /// Create a new document from a stream.
01116         /// </summary>
01117         /// <param name="ctx">The context to which the document will belong.</param>
01118         /// <param name="data">A pointer to a byte array containing the data that makes up the
      document.</param>
01119         /// <param name="data_length">The length in bytes of the data that makes up the
      document.</param>
01120         /// <param name="file_type">The type (extension) of the document.</param>
01121         /// <param name="get_image_resolution">If this is not 0, try opening the stream as an image
      and return the actual resolution (in DPI) of the image. Otherwise (or if trying to open the stream as
      an image fails), the returned resolution will be -1.</param>
01122         /// <param name="out_doc">The newly created document.</param>
01123         /// <param name="out_str">The newly created stream (so that it can be disposed later).</param>
01124         /// <param name="out_page_count">The number of pages in the document.</param>
01125         /// <param name="out_image_xres">If the document is an image file, the horizontal resolution
      of the image.</param>
01126         /// <param name="out_image_yres">If the document is an image file, the vertical resolution of
      the image.</param>
01127         /// <returns>An integer equivalent to <see cref="ExitCodes"/> detailing whether any errors
      occurred.</returns>
01128         [DllImport("MuPDFWrapper", CallingConvention = CallingConvention.Cdecl)]
01129         internal static extern int CreateDocumentFromStream(IntPtr ctx, IntPtr data, ulong
      data_length, string file_type, int get_image_resolution, ref IntPtr out_doc, ref IntPtr out_str, ref
      int out_page_count, ref float out_image_xres, ref float out_image_yres);
01130
01131         /// <summary>
01132         /// Create a new document from a file name.
01133         /// </summary>
01134         /// <param name="ctx">The context to which the document will belong.</param>
```

```
01135         /// <param name="file_name">The path of the file to open, UTF-8 encoded.</param>
01136         /// <param name="get_image_resolution">If this is not 0, try opening the file as an image and
      return the actual resolution (in DPI) of the image. Otherwise (or if trying to open the file as an
      image fails), the returned resolution will be -1.</param>
01137         /// <param name="out_doc">The newly created document.</param>
01138         /// <param name="out_page_count">The number of pages in the document.</param>
01139         /// <returns>An integer equivalent to <see cref="ExitCodes"/> detailing whether any errors
      occurred.</returns>
01140         /// <param name="out_image_xres">If the document is an image file, the horizontal resolution
      of the image.</param>
01141         /// <param name="out_image_yres">If the document is an image file, the vertical resolution of
      the image.</param>
01142         [DllImport("MuPDFWrapper", CallingConvention = CallingConvention.Cdecl)]
01143         internal static extern int CreateDocumentFromFile(IntPtr ctx, IntPtr file_name, int
      get_image_resolution, ref IntPtr out_doc, ref int out_page_count, ref float out_image_xres, ref float
      out_image_yres);
01144
01145         /// <summary>
01146         /// Free a stream and its associated resources.
01147         /// </summary>
01148         /// <param name="ctx">The context that was used while creating the stream.</param>
01149         /// <param name="str">The stream to free.</param>
01150         /// <returns>An integer equivalent to <see cref="ExitCodes"/> detailing whether any errors
      occurred.</returns>
01151         [DllImport("MuPDFWrapper", CallingConvention = CallingConvention.Cdecl)]
01152         internal static extern int DisposeStream(IntPtr ctx, IntPtr str);
01153
01154         /// <summary>
01155         /// Free a document and its associated resources.
01156         /// </summary>
01157         /// <param name="ctx">The context that was used in creating the document.</param>
01158         /// <param name="doc">The document to free.</param>
01159         /// <returns>An integer equivalent to <see cref="ExitCodes"/> detailing whether any errors
      occurred.</returns>
01160         [DllImport("MuPDFWrapper", CallingConvention = CallingConvention.Cdecl)]
01161         internal static extern int DisposeDocument(IntPtr ctx, IntPtr doc);
01162
01163         /// <summary>
01164         /// Render (part of) a display list to an array of bytes starting at the specified pointer.
01165         /// </summary>
01166         /// <param name="ctx">A context to hold the exception stack and the cached resources.</param>
01167         /// <param name="list">The display list to render.</param>
01168         /// <param name="x0">The left coordinate in page units of the region of the display list that
      should be rendererd.</param>
01169         /// <param name="y0">The top coordinate in page units of the region of the display list that
      should be rendererd.</param>
01170         /// <param name="x1">The right coordinate in page units of the region of the display list that
      should be rendererd.</param>
01171         /// <param name="y1">The bottom coordinate in page units of the region of the display list
      that should be rendererd.</param>
01172         /// <param name="zoom">How much the specified region should be scaled when rendering. This
      determines the size in pixels of the rendered image.</param>
01173         /// <param name="colorFormat">The pixel data format.</param>
01174         /// <param name="pixel_storage">A pointer indicating where the pixel bytes will be written.
      There must be enough space available!</param>
01175         /// <param name="cookie">A pointer to a cookie object that can be used to track progress
      and/or abort rendering. Can be null.</param>
01176         /// <returns>An integer equivalent to <see cref="ExitCodes"/> detailing whether any errors
      occurred.</returns>
01177         [DllImport("MuPDFWrapper", CallingConvention = CallingConvention.Cdecl)]
01178         internal static extern int RenderSubDisplayList(IntPtr ctx, IntPtr list, float x0, float y0,
      float x1, float y1, float zoom, int colorFormat, IntPtr pixel_storage, IntPtr cookie);
01179
01180         /// <summary>
01181         /// Load a page from a document.
01182         /// </summary>
01183         /// <param name="ctx">The context to which the document belongs.</param>
01184         /// <param name="doc">The document from which the page should be extracted.</param>
01185         /// <param name="page_number">The page number.</param>
01186         /// <param name="out_page">The newly extracted page.</param>
01187         /// <param name="out_x">The left coordinate of the page's bounds.</param>
01188         /// <param name="out_y">The top coordinate of the page's bounds.</param>
01189         /// <param name="out_w">The width of the page.</param>
01190         /// <param name="out_h">The height of the page.</param>
01191         /// <returns>An integer equivalent to <see cref="ExitCodes"/> detailing whether any errors
      occurred.</returns>
01192         [DllImport("MuPDFWrapper", CallingConvention = CallingConvention.Cdecl)]
01193         internal static extern int LoadPage(IntPtr ctx, IntPtr doc, int page_number, ref IntPtr
      out_page, ref float out_x, ref float out_y, ref float out_w, ref float out_h);
01194
01195         /// <summary>
01196         /// Free a page and its associated resources.
01197         /// </summary>
01198         /// <param name="ctx">The context to which the document containing the page belongs.</param>
01199         /// <param name="page">The page to free.</param>
01200         /// <returns>An integer equivalent to <see cref="ExitCodes"/> detailing whether any errors
      occurred.</returns>
```

```
01201         [DllImport("MuPDFWrapper", CallingConvention = CallingConvention.Cdecl)]
01202         internal static extern int DisposePage(IntPtr ctx, IntPtr page);
01203 
01204         /// <summary>
01205         /// Create cloned contexts that can be used in multithreaded rendering.
01206         /// </summary>
01207         /// <param name="ctx">The original context to clone.</param>
01208         /// <param name="count">The number of cloned contexts to create.</param>
01209         /// <param name="out_contexts">An array of pointers to the cloned contexts.</param>
01210         /// <returns>An integer equivalent to <see cref="ExitCodes"/> detailing whether any errors
      occurred.</returns>
01211         [DllImport("MuPDFWrapper", CallingConvention = CallingConvention.Cdecl)]
01212         internal static extern int CloneContext(IntPtr ctx, int count, IntPtr out_contexts);
01213 
01214         /// <summary>
01215         /// Save (part of) a display list to an image file in the specified format.
01216         /// </summary>
01217         /// <param name="ctx">A context to hold the exception stack and the cached resources.</param>
01218         /// <param name="list">The display list to render.</param>
01219         /// <param name="x0">The left coordinate in page units of the region of the display list that
      should be rendererd.</param>
01220         /// <param name="y0">The top coordinate in page units of the region of the display list that
      should be rendererd.</param>
01221         /// <param name="x1">The right coordinate in page units of the region of the display list that
      should be rendererd.</param>
01222         /// <param name="y1">The bottom coordinate in page units of the region of the display list
      that should be rendererd.</param>
01223         /// <param name="zoom">How much the specified region should be scaled when rendering. This
      determines the size in pixels of the rendered image.</param>
01224         /// <param name="colorFormat">The pixel data format.</param>
01225         /// <param name="file_name">The path to the output file, UTF-8 encoded.</param>
01226         /// <param name="output_format">An integer equivalent to <see cref="RasterOutputFileTypes"/>
      specifying the output format.</param>
01227         /// <returns>An integer equivalent to <see cref="ExitCodes"/> detailing whether any errors
      occurred.</returns>
01228         [DllImport("MuPDFWrapper", CallingConvention = CallingConvention.Cdecl)]
01229         internal static extern int SaveImage(IntPtr ctx, IntPtr list, float x0, float y0, float x1,
      float y1, float zoom, int colorFormat, IntPtr file_name, int output_format);
01230 
01231         /// <summary>
01232         /// Write (part of) a display list to an image buffer in the specified format.
01233         /// </summary>
01234         /// <param name="ctx">A context to hold the exception stack and the cached resources.</param>
01235         /// <param name="list">The display list to render.</param>
01236         /// <param name="x0">The left coordinate in page units of the region of the display list that
      should be rendererd.</param>
01237         /// <param name="y0">The top coordinate in page units of the region of the display list that
      should be rendererd.</param>
01238         /// <param name="x1">The right coordinate in page units of the region of the display list that
      should be rendererd.</param>
01239         /// <param name="y1">The bottom coordinate in page units of the region of the display list
      that should be rendererd.</param>
01240         /// <param name="zoom">How much the specified region should be scaled when rendering. This
      determines the size in pixels of the rendered image.</param>
01241         /// <param name="colorFormat">The pixel data format.</param>
01242         /// <param name="output_format">An integer equivalent to <see cref="RasterOutputFileTypes"/>
      specifying the output format.</param>
01243         /// <param name="out_buffer">The address of the buffer on which the data has been written
      (only useful for disposing the buffer later).</param>
01244         /// <param name="out_data">The address of the byte array where the data has been actually
      written.</param>
01245         /// <param name="out_length">The length in bytes of the image data.</param>
01246         /// <returns>An integer equivalent to <see cref="ExitCodes"/> detailing whether any errors
      occurred.</returns>
01247         [DllImport("MuPDFWrapper", CallingConvention = CallingConvention.Cdecl)]
01248         internal static extern int WriteImage(IntPtr ctx, IntPtr list, float x0, float y0, float x1,
      float y1, float zoom, int colorFormat, int output_format, ref IntPtr out_buffer, ref IntPtr out_data,
      ref ulong out_length);
01249 
01250         /// <summary>
01251         /// Free a native buffer and its associated resources.
01252         /// </summary>
01253         /// <param name="ctx">A context to hold the exception stack and the cached resources.</param>
01254         /// <param name="buf">The buffer to free.</param>
01255         /// <returns>An integer equivalent to <see cref="ExitCodes"/> detailing whether any errors
      occurred.</returns>
01256         [DllImport("MuPDFWrapper", CallingConvention = CallingConvention.Cdecl)]
01257         internal static extern int DisposeBuffer(IntPtr ctx, IntPtr buf);
01258 
01259         /// <summary>
01260         /// Create a new document writer object.
01261         /// </summary>
01262         /// <param name="ctx">A context to hold the exception stack and the cached resources.</param>
01263         /// <param name="file_name">The name of file that will hold the writer's output, UTF-8
      encoded.</param>
01264         /// <param name="format">An integer equivalent to <see cref="DocumentOutputFileTypes"/>
      specifying the output format.</param>
```

```
01265         /// <param name="out_document_writer">A pointer to the new document writer object.</param>
01266         /// <returns>An integer equivalent to <see cref="ExitCodes"/> detailing whether any errors
      occurred.</returns>
01267         [DllImport("MuPDFWrapper", CallingConvention = CallingConvention.Cdecl)]
01268         internal static extern int CreateDocumentWriter(IntPtr ctx, IntPtr file_name, int format, ref
      IntPtr out_document_writer);
01269
01270         /// <summary>
01271         /// Render (part of) a display list as a page in the specified document writer.
01272         /// </summary>
01273         /// <param name="ctx">A context to hold the exception stack and the cached resources.</param>
01274         /// <param name="list">The display list to render.</param>
01275         /// <param name="x0">The left coordinate in page units of the region of the display list that
      should be rendererd.</param>
01276         /// <param name="y0">The top coordinate in page units of the region of the display list that
      should be rendererd.</param>
01277         /// <param name="x1">The right coordinate in page units of the region of the display list that
      should be rendererd.</param>
01278         /// <param name="y1">The bottom coordinate in page units of the region of the display list
      that should be rendererd.</param>
01279         /// <param name="zoom">How much the specified region should be scaled when rendering. This
      will determine the final size of the page.</param>
01280         /// <param name="writ">The document writer on which the page should be written.</param>
01281         /// <returns>An integer equivalent to <see cref="ExitCodes"/> detailing whether any errors
      occurred.</returns>
01282         [DllImport("MuPDFWrapper", CallingConvention = CallingConvention.Cdecl)]
01283         internal static extern int WriteSubDisplayListAsPage(IntPtr ctx, IntPtr list, float x0, float
      y0, float x1, float y1, float zoom, IntPtr writ);
01284
01285         /// <summary>
01286         /// Finalise a document writer, closing the file and freeing all resources.
01287         /// </summary>
01288         /// <param name="ctx">The context that was used to create the document writer.</param>
01289         /// <param name="writ">The document writer to finalise.</param>
01290         /// <returns>An integer equivalent to <see cref="ExitCodes"/> detailing whether any errors
      occurred.</returns>
01291         [DllImport("MuPDFWrapper", CallingConvention = CallingConvention.Cdecl)]
01292         internal static extern int FinalizeDocumentWriter(IntPtr ctx, IntPtr writ);
01293
01294         /// <summary>
01295         /// Get the contents of a structured text character.
01296         /// </summary>
01297         /// <param name="character">The address of the character.</param>
01298         /// <param name="out_c">Unicode code point of the character.</param>
01299         /// <param name="out_color">An sRGB hex representation of the colour of the character.</param>
01300         /// <param name="out_origin_x">The x coordinate of the baseline origin of the
      character.</param>
01301         /// <param name="out_origin_y">The y coordinate of the baseline origin of the
      character.</param>
01302         /// <param name="out_size">The size in points of the character.</param>
01303         /// <param name="out_ll_x">The x coordinate of the lower left corner of the bounding
      quad.</param>
01304         /// <param name="out_ll_y">The y coordinate of the lower left corner of the bounding
      quad.</param>
01305         /// <param name="out_ul_x">The x coordinate of the upper left corner of the bounding
      quad.</param>
01306         /// <param name="out_ul_y">The y coordinate of the upper left corner of the bounding
      quad.</param>
01307         /// <param name="out_ur_x">The x coordinate of the upper right corner of the bounding
      quad.</param>
01308         /// <param name="out_ur_y">The y coordinate of the upper right corner of the bounding
      quad.</param>
01309         /// <param name="out_lr_x">The x coordinate of the lower right corner of the bounding
      quad.</param>
01310         /// <param name="out_lr_y">The y coordinate of the lower right corner of the bounding
      quad.</param>
01311         /// <returns>An integer equivalent to <see cref="ExitCodes"/> detailing whether any errors
      occurred.</returns>
01312         [DllImport("MuPDFWrapper", CallingConvention = CallingConvention.Cdecl)]
01313         internal static extern int GetStructuredTextChar(IntPtr character, ref int out_c, ref int
      out_color, ref float out_origin_x, ref float out_origin_y, ref float out_size, ref float out_ll_x,
      ref float out_ll_y, ref float out_ul_x, ref float out_ul_y, ref float out_ur_x, ref float out_ur_y,
      ref float out_lr_x, ref float out_lr_y);
01314
01315         /// <summary>
01316         /// Get an array of structured text characters from a structured text line.
01317         /// </summary>
01318         /// <param name="line">The structured text line from which the characters should be
      extracted.</param>
01319         /// <param name="out_chars">An array of pointers to the structured text characters.</param>
01320         /// <returns>An integer equivalent to <see cref="ExitCodes"/> detailing whether any errors
      occurred.</returns>
01321         [DllImport("MuPDFWrapper", CallingConvention = CallingConvention.Cdecl)]
01322         internal static extern int GetStructuredTextChars(IntPtr line, IntPtr out_chars);
01323
01324         /// <summary>
01325         /// Get the contents of a structured text line.
```

```
01326         /// </summary>
01327         /// <param name="line">The address of the line.</param>
01328         /// <param name="out_wmode">An integer equivalent to <see cref="MuPDFStructuredTextLine"/>
      representing the writing mode of the line.</param>
01329         /// <param name="out_x0">The left coordinate in page units of the bounding box of the
      line.</param>
01330         /// <param name="out_y0">The top coordinate in page units of the bounding box of the
      line.</param>
01331         /// <param name="out_x1">The right coordinate in page units of the bounding box of the
      line.</param>
01332         /// <param name="out_y1">The bottom coordinate in page units of the bounding box of the
      line.</param>
01333         /// <param name="out_x">The x component of the normalised direction of the baseline.</param>
01334         /// <param name="out_y">The y component of the normalised direction of the baseline.</param>
01335         /// <param name="out_char_count">The number of characters in the line.</param>
01336         /// <returns>An integer equivalent to <see cref="ExitCodes"/> detailing whether any errors
      occurred.</returns>
01337         [DllImport("MuPDFWrapper", CallingConvention = CallingConvention.Cdecl)]
01338         internal static extern int GetStructuredTextLine(IntPtr line, ref int out_wmode, ref float
      out_x0, ref float out_y0, ref float out_x1, ref float out_y1, ref float out_x, ref float out_y, ref
      int out_char_count);
01339
01340         /// <summary>
01341         /// Get an array of structured text lines from a structured text block.
01342         /// </summary>
01343         /// <param name="block">The structured text block from which the lines should be
      extracted.</param>
01344         /// <param name="out_lines">An array of pointers to the structured text lines.</param>
01345         /// <returns>An integer equivalent to <see cref="ExitCodes"/> detailing whether any errors
      occurred.</returns>
01346         [DllImport("MuPDFWrapper", CallingConvention = CallingConvention.Cdecl)]
01347         internal static extern int GetStructuredTextLines(IntPtr block, IntPtr out_lines);
01348
01349         /// <summary>
01350         /// Get the contents of a structured text block.
01351         /// </summary>
01352         /// <param name="block">The address of the block.</param>
01353         /// <param name="out_type">An integer equivalent to <see
      cref="MuPDFStructuredTextBlock.Types"/> representing the type of the block.</param>
01354         /// <param name="out_x0">The left coordinate in page units of the bounding box of the
      block.</param>
01355         /// <param name="out_y0">The top coordinate in page units of the bounding box of the
      block.</param>
01356         /// <param name="out_x1">The right coordinate in page units of the bounding box of the
      block.</param>
01357         /// <param name="out_y1">The bottom coordinate in page units of the bounding box of the
      block.</param>
01358         /// <param name="out_line_count">The number of lines in the block.</param>
01359         /// <returns>An integer equivalent to <see cref="ExitCodes"/> detailing whether any errors
      occurred.</returns>
01360         [DllImport("MuPDFWrapper", CallingConvention = CallingConvention.Cdecl)]
01361         internal static extern int GetStructuredTextBlock(IntPtr block, ref int out_type, ref float
      out_x0, ref float out_y0, ref float out_x1, ref float out_y1, ref int out_line_count);
01362
01363         /// <summary>
01364         /// Get an array of structured text blocks from a structured text page.
01365         /// </summary>
01366         /// <param name="page">The structured text page from which the blocks should be
      extracted.</param>
01367         /// <param name="out_blocks">An array of pointers to the structured text blocks.</param>
01368         /// <returns>An integer equivalent to <see cref="ExitCodes"/> detailing whether any errors
      occurred.</returns>
01369         [DllImport("MuPDFWrapper", CallingConvention = CallingConvention.Cdecl)]
01370         internal static extern int GetStructuredTextBlocks(IntPtr page, IntPtr out_blocks);
01371
01372         /// <summary>
01373         /// Get a structured text representation of a display list.
01374         /// </summary>
01375         /// <param name="ctx">A context to hold the exception stack and the cached resources.</param>
01376         /// <param name="list">The display list whose structured text representation is
      sought.</param>
01377         /// <param name="out_page">The address of the structured text page.</param>
01378         /// <param name="out_stext_block_count">The number of structured text blocks in the
      page.</param>
01379         /// <returns>An integer equivalent to <see cref="ExitCodes"/> detailing whether any errors
      occurred.</returns>
01380         [DllImport("MuPDFWrapper", CallingConvention = CallingConvention.Cdecl)]
01381         internal static extern int GetStructuredTextPage(IntPtr ctx, IntPtr list, ref IntPtr out_page,
      ref int out_stext_block_count);
01382
01383         /// <summary>
01384         /// Delegate defining a callback function that is invoked by the unmanaged MuPDF library to
      indicate OCR progress.
01385         /// </summary>
01386         /// <param name="progress">The current progress, ranging from 0 to 100.</param>
01387         /// <returns>This function should return 0 to indicate that the OCR process should continue,
      or 1 to indicate that it should be stopped.</returns>
```

```
01388         internal delegate int ProgressCallback(int progress);
01389
01390         /// <summary>
01391         /// Get a structured text representation of a display list, using the Tesseract OCR engine.
01392         /// </summary>
01393         /// <param name="ctx">A context to hold the exception stack and the cached resources.</param>
01394         /// <param name="list">The display list whose structured text representation is
      sought.</param>
01395         /// <param name="out_page">The address of the structured text page.</param>
01396         /// <param name="out_stext_block_count">The number of structured text blocks in the
      page.</param>
01397         /// <param name="zoom">How much the specified region should be scaled when rendering. This
      determines the size in pixels of the image that is passed to Tesseract.</param>
01398         /// <param name="x0">The left coordinate in page units of the region of the display list that
      should be analysed.</param>
01399         /// <param name="y0">The top coordinate in page units of the region of the display list that
      should be analysed.</param>
01400         /// <param name="x1">The right coordinate in page units of the region of the display list that
      should be analysed.</param>
01401         /// <param name="y1">The bottom coordinate in page units of the region of the display list
      that should be analysed.</param>
01402         /// <param name="prefix">A string value that will be used as an argument for the <c>putenv</c>
      function. If this is <see langword="null"/>, the <c>putenv</c> function is not invoked. Usually used
      to set the value of the <c>TESSDATA_PREFIX</c> environment variable.</param>
01403         /// <param name="language">The name of the language model file to use for the OCR.</param>
01404         /// <param name="callback">A progress callback function. This function will be called with an
      integer parameter ranging from 0 to 100 to indicate OCR progress, and should return 0 to continue or
      1 to abort the OCR process.</param>
01405         /// <returns>An integer equivalent to <see cref="ExitCodes"/> detailing whether any errors
      occurred.</returns>
01406         [DllImport("MuPDFWrapper", CallingConvention = CallingConvention.Cdecl)]
01407         internal static extern int GetStructuredTextPageWithOCR(IntPtr ctx, IntPtr list, ref IntPtr
      out_page, ref int out_stext_block_count, float zoom, float x0, float y0, float x1, float y1, string
      prefix, string language, [MarshalAs(UnmanagedType.FunctionPtr)] ProgressCallback callback);
01408
01409         /// <summary>
01410         /// Free a native structured text page and its associated resources.
01411         /// </summary>
01412         /// <param name="ctx"></param>
01413         /// <param name="page"></param>
01414         /// <returns>An integer equivalent to <see cref="ExitCodes"/> detailing whether any errors
      occurred.</returns>
01415         [DllImport("MuPDFWrapper", CallingConvention = CallingConvention.Cdecl)]
01416         internal static extern int DisposeStructuredTextPage(IntPtr ctx, IntPtr page);
01417
01418         /// <summary>
01419         /// Redirect the standard output and standard error to named pipes with the specified names.
      On Windows, these are actually named pipes; on Linux and macOS, these are Unix sockets (matching the
      behaviour of System.IO.Pipes). Note that this has side-effects.
01420         /// </summary>
01421         /// <param name="stdoutFD">When the method returns, this variable will contain the file
      descriptor corresponding to the "real" stdout.</param>
01422         /// <param name="stderrFD">When the method returns, this variable will contain the file
      descriptor corresponding to the "real" stderr.</param>
01423         /// <param name="stdoutPipeName">The name of the pipe where stdout will be redirected. On
      Windows, this should be of the form "\\.\pipe\xxx", while on Linux and macOS it should be an absolute
      file path (maximum length 107/108 characters).</param>
01424         /// <param name="stderrPipeName">The name of the pipe where stderr will be redirected. On
      Windows, this should be of the form "\\.\pipe\xxx", while on Linux and macOS it should be an absolute
      file path (maximum length 107/108 characters).</param>
01425         [DllImport("MuPDFWrapper", CallingConvention = CallingConvention.Cdecl)]
01426         internal static extern void RedirectOutput(out int stdoutFD, out int stderrFD, string
      stdoutPipeName, string stderrPipeName);
01427
01428         /// <summary>
01429         /// Write the specified <paramref name="text"/> to a file descriptor. Use 1 for stdout and 2
      for stderr (which may have been redirected).
01430         /// </summary>
01431         /// <param name="fileDescriptor">The file descriptor on which to write.</param>
01432         /// <param name="text">The text to write.</param>
01433         /// <param name="length">The length of the text to write (i.e., text.Length).</param>
01434         [DllImport("MuPDFWrapper", CallingConvention = CallingConvention.Cdecl)]
01435         internal static extern void WriteToFileDescriptor(int fileDescriptor, string text, int
      length);
01436
01437         /// <summary>
01438         /// Reset the standard output and standard error (or redirect them to the specified file
      descriptors, theoretically). Use with the <paramref name="stdoutFD"/> and <paramref name="stderrFD"/>
      returned by <see cref="RedirectOutput"/> to undo what it did.
01439         /// </summary>
01440         /// <param name="stdoutFD">The file descriptor corresponding to the "real" stdout.</param>
01441         /// <param name="stderrFD">The file descriptor corresponding to the "real" stderr.</param>
01442         [DllImport("MuPDFWrapper", CallingConvention = CallingConvention.Cdecl)]
01443         internal static extern void ResetOutput(int stdoutFD, int stderrFD);
01444
01445         /// <summary>
01446         /// Unlocks a document with a password.
```

```
01447         /// </summary>
01448         /// <param name="ctx">A context to hold the exception stack and the cached resources.</param>
01449         /// <param name="doc">The document that needs to be unlocked.</param>
01450         /// <param name="password">The password to unlock the document.</param>
01451         /// <returns>0 if the document could not be unlocked, 1 if the document did not require
      unlocking in the first place, 2 if the document was unlocked using the user password and 4 if the
      document was unlocked using the owner password.</returns>
01452         [DllImport("MuPDFWrapper", CallingConvention = CallingConvention.Cdecl)]
01453         internal static extern int UnlockWithPassword(IntPtr ctx, IntPtr doc, string password);
01454 
01455         /// <summary>
01456         /// Checks whether a password is required to open the document.
01457         /// </summary>
01458         /// <param name="ctx">A context to hold the exception stack and the cached resources.</param>
01459         /// <param name="doc">The document that needs to be checked.</param>
01460         /// <returns>0 if a password is not needed, 1 if a password is needed.</returns>
01461         [DllImport("MuPDFWrapper", CallingConvention = CallingConvention.Cdecl)]
01462         internal static extern int CheckIfPasswordNeeded(IntPtr ctx, IntPtr doc);
01463 
01464         /// <summary>
01465         /// Returns the current permissions for the document. Note that these are not actually
      enforced.
01466         /// </summary>
01467         /// <param name="ctx">A context to hold the exception stack and the cached resources.</param>
01468         /// <param name="doc">The document whose permissions need to be checked.</param>
01469         /// <returns>An integer with bit 0 set if the document can be printed, bit 1 set if it can be
      copied, bit 2 set if it can be edited, and bit 3 set if it can be annotated.</returns>
01470         [DllImport("MuPDFWrapper", CallingConvention = CallingConvention.Cdecl)]
01471         internal static extern int GetPermissions(IntPtr ctx, IntPtr doc);
01472     }
01473 }
```

8.5 MuPDFContext.cs

```
00001 /*
00002     MuPDFCore - A set of multiplatform .NET Core bindings for MuPDF.
00003     Copyright (C) 2020  Giorgio Bianchini
00004 
00005     This program is free software: you can redistribute it and/or modify
00006     it under the terms of the GNU Affero General Public License as
00007     published by the Free Software Foundation, version 3.
00008 
00009     This program is distributed in the hope that it will be useful,
00010     but WITHOUT ANY WARRANTY; without even the implied warranty of
00011     MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.  See the
00012     GNU Affero General Public License for more details.
00013 
00014     You should have received a copy of the GNU Affero General Public License
00015     along with this program.  If not, see <http://www.gnu.org/licenses/>
00016 */
00017 
00018 using System;
00019 
00020 namespace MuPDFCore
00021 {
00022     /// <summary>
00023     /// A wrapper around a MuPDF context object, which contains the exception stack and the resource
      cache store.
00024     /// </summary>
00025     public class MuPDFContext : IDisposable
00026     {
00027         /// <summary>
00028         /// A pointer to the native context object.
00029         /// </summary>
00030         internal readonly IntPtr NativeContext;
00031 
00032         /// <summary>
00033         /// The current size in bytes of the resource cache store. Read-only.
00034         /// </summary>
00035         public long StoreSize
00036         {
00037             get
00038             {
00039                 return (long)NativeMethods.GetCurrentStoreSize(this.NativeContext);
00040             }
00041         }
00042 
00043         /// <summary>
00044         /// The maximum size in bytes of the resource cache store. Read-only.
00045         /// </summary>
00046         public long StoreMaxSize
00047         {
00048             get
```

```
00049             {
00050                 return (long)NativeMethods.GetMaxStoreSize(this.NativeContext);
00051             }
00052         }
00053 
00054         /// <summary>
00055         /// Create a new <see cref="MuPDFContext"/> instance with the specified cache store size.
00056         /// </summary>
00057         /// <param name="storeSize">The maximum size in bytes of the resource cache store. The default
      value is 256 MiB.</param>
00058         public MuPDFContext(uint storeSize = 256 « 20)
00059         {
00060             ExitCodes result = (ExitCodes)NativeMethods.CreateContext((ulong)storeSize, ref
      NativeContext);
00061 
00062             switch (result)
00063             {
00064                 case ExitCodes.EXIT_SUCCESS:
00065                     break;
00066                 case ExitCodes.ERR_CANNOT_CREATE_CONTEXT:
00067                     throw new MuPDFException("Cannot create MuPDF context", result);
00068                 case ExitCodes.ERR_CANNOT_REGISTER_HANDLERS:
00069                     throw new MuPDFException("Cannot register document handlers", result);
00070                 default:
00071                     throw new MuPDFException("Unknown error", result);
00072             }
00073         }
00074 
00075         /// <summary>
00076         /// Wrap an existing pointer to a native MuPDF context object.
00077         /// </summary>
00078         /// <param name="nativeContext">The pointer to the native context that should be used.</param>
00079         internal MuPDFContext(IntPtr nativeContext)
00080         {
00081             this.NativeContext = nativeContext;
00082         }
00083 
00084         /// <summary>
00085         /// Evict all items from the resource cache store (freeing the memory where they were held).
00086         /// </summary>
00087         public void ClearStore()
00088         {
00089             NativeMethods.EmptyStore(this.NativeContext);
00090         }
00091 
00092         /// <summary>
00093         /// Evict items from the resource cache store (freeing the memory where they were held) until
      the the size of the store drops to the specified fraction of the current size.
00094         /// </summary>
00095         /// <param name="fraction">The fraction of the current size that constitutes the target size
      of the store. If this is &lt;= 0, the cache is cleared. If this is &gt;= 1, nothing happens.</param>
00096         public void ShrinkStore(double fraction)
00097         {
00098             if (fraction <= 0)
00099             {
00100                 ClearStore();
00101             }
00102             else if (Math.Round(fraction * 100) < 100)
00103             {
00104                 NativeMethods.ShrinkStore(this.NativeContext, (uint)Math.Round(fraction * 100));
00105             }
00106         }
00107 
00108         private bool disposedValue;
00109 
00110         ///<inheritdoc/>
00111         protected virtual void Dispose(bool disposing)
00112         {
00113             if (!disposedValue)
00114             {
00115                 if (disposing)
00116                 {
00117                     // TODO: eliminare lo stato gestito (oggetti gestiti)
00118                 }
00119 
00120                 NativeMethods.DisposeContext(NativeContext);
00121                 disposedValue = true;
00122             }
00123         }
00124 
00125         ///<inheritdoc/>
00126         ~MuPDFContext()
00127         {
00128             Dispose(disposing: false);
00129         }
00130 
00131         ///<inheritdoc/>
```

```
00132         public void Dispose()
00133         {
00134             Dispose(disposing: true);
00135             GC.SuppressFinalize(this);
00136         }
00137     }
00138 }
```

8.6 MuPDFDisplayList.cs

```
00001 /*
00002     MuPDFCore - A set of multiplatform .NET Core bindings for MuPDF.
00003     Copyright (C) 2020  Giorgio Bianchini
00004 
00005     This program is free software: you can redistribute it and/or modify
00006     it under the terms of the GNU Affero General Public License as
00007     published by the Free Software Foundation, version 3.
00008 
00009     This program is distributed in the hope that it will be useful,
00010     but WITHOUT ANY WARRANTY; without even the implied warranty of
00011     MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.  See the
00012     GNU Affero General Public License for more details.
00013 
00014     You should have received a copy of the GNU Affero General Public License
00015     along with this program.  If not, see <http://www.gnu.org/licenses/>
00016 */
00017 
00018 using System;
00019 
00020 namespace MuPDFCore
00021 {
00022     /// <summary>
00023     /// A wrapper around a MuPDF display list object, which contains the necessary informations to
      render a page to an image.
00024     /// </summary>
00025     internal class MuPDFDisplayList : IDisposable
00026     {
00027         /// <summary>
00028         /// The context that owns the document that was used to create this display list.
00029         /// </summary>
00030         private readonly MuPDFContext OwnerContext;
00031 
00032         /// <summary>
00033         /// A pointer to the native display list object.
00034         /// </summary>
00035         readonly internal IntPtr NativeDisplayList;
00036 
00037         /// <summary>
00038         /// The display list's bounds in page units. Read-only.
00039         /// </summary>
00040         public Rectangle Bounds { get; }
00041 
00042         /// <summary>
00043         /// Create a new <see cref="MuPDFDisplayList"/> instance from the specified page.
00044         /// </summary>
00045         /// <param name="context">The context that owns the document from which the page was
      taken.</param>
00046         /// <param name="page">The page from which the display list should be generated.</param>
00047         /// <param name="includeAnnotations">If this is <see langword="true" />, annotations (e.g.
      signatures) are included in the display list that is generated. Otherwise, only the page contents are
      included.</param>
00048         public MuPDFDisplayList(MuPDFContext context, MuPDFPage page, bool includeAnnotations = true)
00049         {
00050             this.OwnerContext = context;
00051 
00052             float x0 = 0;
00053             float y0 = 0;
00054             float x1 = 0;
00055             float y1 = 0;
00056 
00057             ExitCodes result = (ExitCodes)NativeMethods.GetDisplayList(context.NativeContext,
      page.NativePage, includeAnnotations ? 1 : 0, ref NativeDisplayList, ref x0, ref y0, ref x1, ref y1);
00058 
00059             switch (result)
00060             {
00061                 case ExitCodes.EXIT_SUCCESS:
00062                     break;
00063                 case ExitCodes.ERR_CANNOT_RENDER:
00064                     throw new MuPDFException("Cannot render page", result);
00065                 default:
00066                     throw new MuPDFException("Unknown error", result);
00067             }
00068 
```

```
00069             this.Bounds = new Rectangle(Math.Round(x0 * page.OwnerDocument.ImageXRes / 72.0 * 1000) /
      1000, Math.Round(y0 * page.OwnerDocument.ImageYRes / 72.0 * 1000) / 1000, Math.Round(x1 *
      page.OwnerDocument.ImageXRes / 72.0 * 1000) / 1000, Math.Round(y1 * page.OwnerDocument.ImageYRes /
      72.0 * 1000) / 1000);
00070         }
00071
00072         private bool disposedValue;
00073
00074         protected virtual void Dispose(bool disposing)
00075         {
00076             if (!disposedValue)
00077             {
00078                 NativeMethods.DisposeDisplayList(OwnerContext.NativeContext, NativeDisplayList);
00079                 disposedValue = true;
00080             }
00081         }
00082
00083         ~MuPDFDisplayList()
00084         {
00085             Dispose(disposing: false);
00086         }
00087
00088         public void Dispose()
00089         {
00090             Dispose(disposing: true);
00091             GC.SuppressFinalize(this);
00092         }
00093     }
00094 }
```

8.7 MuPDFDocument.cs

```
00001 /*
00002     MuPDFCore - A set of multiplatform .NET Core bindings for MuPDF.
00003     Copyright (C) 2020  Giorgio Bianchini
00004
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00006     it under the terms of the GNU Affero General Public License as
00007     published by the Free Software Foundation, version 3.
00008
00009     This program is distributed in the hope that it will be useful,
00010     but WITHOUT ANY WARRANTY; without even the implied warranty of
00011     MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.  See the
00012     GNU Affero General Public License for more details.
00013
00014     You should have received a copy of the GNU Affero General Public License
00015     along with this program.  If not, see <http://www.gnu.org/licenses/>
00016 */
00017
00018 using System;
00019 using System.IO;
00020 using System.Runtime.InteropServices;
00021 using System.Text;
00022 using System.Threading;
00023 using System.Threading.Tasks;
00024
00025 namespace MuPDFCore
00026 {
00027     /// <summary>
00028     /// A wrapper over a MuPDF document object, which contains possibly multiple pages.
00029     /// </summary>
00030     public class MuPDFDocument : IDisposable
00031     {
00032         /// <summary>
00033         /// If the document is an image, the horizontal resolution of the image. Otherwise, 72.
00034         /// </summary>
00035         internal double ImageXRes = double.NaN;
00036
00037         /// <summary>
00038         /// If the document is an image, the vertical resolution of the image. Otherwise, 72.
00039         /// </summary>
00040         internal double ImageYRes = double.NaN;
00041
00042         /// <summary>
00043         /// File extensions corresponding to the supported input formats.
00044         /// </summary>
00045         private static readonly string[] FileTypeMagics = new[]
00046         {
00047             ".pdf",
00048             ".xps",
00049             ".cbz",
00050             ".png",
00051             ".jpg",
```

```
00052             ".bmp",
00053             ".gif",
00054             ".tif",
00055             ".pnm",
00056             ".pam",
00057             ".epub",
00058             ".fb2"
00059         };
00060 
00061         /// <summary>
00062         /// An <see cref="IDisposable"/> with a value of null.
00063         /// </summary>
00064         private static IDisposable NullDataHolder = null;
00065 
00066         /// <summary>
00067         /// The context that owns this document.
00068         /// </summary>
00069         private readonly MuPDFContext OwnerContext;
00070 
00071         /// <summary>
00072         /// A pointer to the native document object.
00073         /// </summary>
00074         internal readonly IntPtr NativeDocument;
00075 
00076         /// <summary>
00077         /// A pointer to the native stream that was used to create this document (if any).
00078         /// </summary>
00079         private readonly IntPtr NativeStream = IntPtr.Zero;
00080 
00081         /// <summary>
00082         /// The number of pages in the document.
00083         /// </summary>
00084         private readonly int PageCount;
00085 
00086         /// <summary>
00087         /// An <see cref="IDisposable"/> that will be disposed together with this object.
00088         /// </summary>
00089         private readonly IDisposable DataHolder = null;
00090 
00091         /// <summary>
00092         /// A <see cref="GCHandle"/> that will be freed when this object is disposed.
00093         /// </summary>
00094         private GCHandle? DataHandle = null;
00095 
00096         /// <summary>
00097         /// An array of <see cref="MuPDFDisplayList"/>, one for each page in the document.
00098         /// </summary>
00099         private readonly MuPDFDisplayList[] DisplayLists;
00100 
00101         /// <summary>
00102         /// The pages contained in the document.
00103         /// </summary>
00104         public MuPDFPageCollection Pages { get; }
00105 
00106         /// <summary>
00107         /// Defines whether the images resulting from rendering operations should be clipped to the
      page boundaries.
00108         /// </summary>
00109         public bool ClipToPageBounds { get; set; } = true;
00110 
00111         /// <summary>
00112         /// Describes the encryption state of the document.
00113         /// </summary>
00114         public EncryptionState EncryptionState { get; private set; }
00115 
00116         /// <summary>
00117         /// Describes the restriction state of the document.
00118         /// </summary>
00119         public RestrictionState RestrictionState { get; private set; }
00120 
00121         /// <summary>
00122         /// Describes the operations that are restricted on the document. This is not actually
      enforced by the library,
00123         /// but library users should only allow these operations if the document has been unlocked
      with the owner password
00124         /// (i.e. if <see cref="RestrictionState"/> is <see cref="RestrictionState.Unlocked"/>).
00125         /// </summary>
00126         public DocumentRestrictions Restrictions { get; private set; }
00127 
00128         /// <summary>
00129         /// Create a new <see cref="MuPDFDocument"/> from data bytes accessible through the specified
      pointer.
00130         /// </summary>
00131         /// <param name="context">The context that will own this document.</param>
00132         /// <param name="dataAddress">A pointer to the data bytes that make up the document.</param>
00133         /// <param name="dataLength">The number of bytes to read from the specified address.</param>
00134         /// <param name="fileType">The type of the document to read.</param>
```

```
00135         public MuPDFDocument(MuPDFContext context, IntPtr dataAddress, long dataLength, InputFileTypes
      fileType) : this(context, dataAddress, dataLength, fileType, ref NullDataHolder) { }
00136
00137         /// <summary>
00138         /// Create a new <see cref="MuPDFDocument"/> from data bytes accessible through the specified
      pointer.
00139         /// </summary>
00140         /// <param name="context">The context that will own this document.</param>
00141         /// <param name="dataAddress">A pointer to the data bytes that make up the document.</param>
00142         /// <param name="dataLength">The number of bytes to read from the specified address.</param>
00143         /// <param name="fileType">The type of the document to read.</param>
00144         /// <param name="dataHolder">An <see cref="IDisposable"/> that will be disposed when the <see
      cref="MuPDFDocument"/> is disposed.</param>
00145         public MuPDFDocument(MuPDFContext context, IntPtr dataAddress, long dataLength, InputFileTypes
      fileType, ref IDisposable dataHolder)
00146         {
00147             bool isImage = fileType == InputFileTypes.BMP || fileType == InputFileTypes.GIF ||
      fileType == InputFileTypes.JPEG || fileType == InputFileTypes.PAM || fileType == InputFileTypes.PNG
      || fileType == InputFileTypes.PNM || fileType == InputFileTypes.TIFF;
00148
00149             this.OwnerContext = context;
00150
00151             float xRes = 0;
00152             float yRes = 0;
00153
00154             ExitCodes result =
      (ExitCodes)NativeMethods.CreateDocumentFromStream(context.NativeContext, dataAddress,
      (ulong)dataLength, FileTypeMagics[(int)fileType], isImage ? 1 : 0, ref NativeDocument, ref
      NativeStream, ref PageCount, ref xRes, ref yRes);
00155
00156             if (xRes > 72)
00157             {
00158                 this.ImageXRes = xRes;
00159             }
00160             else
00161             {
00162                 this.ImageXRes = 72;
00163             }
00164
00165             if (yRes > 72)
00166             {
00167                 this.ImageYRes = yRes;
00168             }
00169             else
00170             {
00171                 this.ImageYRes = 72;
00172             }
00173
00174             this.DataHolder = dataHolder;
00175
00176             switch (result)
00177             {
00178                 case ExitCodes.EXIT_SUCCESS:
00179                     break;
00180                 case ExitCodes.ERR_CANNOT_OPEN_STREAM:
00181                     throw new MuPDFException("Cannot open data stream", result);
00182                 case ExitCodes.ERR_CANNOT_OPEN_FILE:
00183                     throw new MuPDFException("Cannot open document", result);
00184                 case ExitCodes.ERR_CANNOT_COUNT_PAGES:
00185                     throw new MuPDFException("Cannot count pages", result);
00186                 default:
00187                     throw new MuPDFException("Unknown error", result);
00188             }
00189
00190             if (NativeMethods.CheckIfPasswordNeeded(context.NativeContext, this.NativeDocument) != 0)
00191             {
00192                 this.EncryptionState = EncryptionState.Encrypted;
00193             }
00194             else
00195             {
00196                 this.EncryptionState = EncryptionState.Unencrypted;
00197             }
00198
00199             int permissions = NativeMethods.GetPermissions(context.NativeContext,
      this.NativeDocument);
00200
00201             int restrictions = 0;
00202
00203             if ((permissions & 1) == 0)
00204             {
00205                 restrictions |= 1;
00206             }
00207
00208             if ((permissions & 2) == 0)
00209             {
00210                 restrictions |= 2;
00211             }
```

```
00212
00213             if ((permissions & 4) == 0)
00214             {
00215                 restrictions |= 4;
00216             }
00217
00218             if ((permissions & 8) == 0)
00219             {
00220                 restrictions |= 8;
00221             }
00222
00223             if (restrictions == 0)
00224             {
00225                 this.Restrictions = DocumentRestrictions.None;
00226                 this.RestrictionState = RestrictionState.Unrestricted;
00227             }
00228             else
00229             {
00230                 this.Restrictions = (DocumentRestrictions)restrictions;
00231                 this.RestrictionState = RestrictionState.Restricted;
00232             }
00233
00234             Pages = new MuPDFPageCollection(context, this, PageCount);
00235             DisplayLists = new MuPDFDisplayList[PageCount];
00236         }
00237
00238         /// <summary>
00239         /// Create a new <see cref="MuPDFDocument"/> from an array of bytes.
00240         /// </summary>
00241         /// <param name="context">The context that will own this document.</param>
00242         /// <param name="data">An array containing the data bytes that make up the document. This must
      not be altered until after the <see cref="MuPDFDocument"/> has been disposed!
00243         /// The address of the array will be pinned, which may cause degradation in the Garbage
      Collector's performance, and is thus only advised for short-lived documents. To avoid this issue,
      marshal the bytes to unmanaged memory and use one of the <see cref="IntPtr"/> constructors.</param>
00244         /// <param name="fileType">The type of the document to read.</param>
00245         public MuPDFDocument(MuPDFContext context, byte[] data, InputFileTypes fileType)
00246         {
00247             bool isImage = fileType == InputFileTypes.BMP || fileType == InputFileTypes.GIF ||
      fileType == InputFileTypes.JPEG || fileType == InputFileTypes.PAM || fileType == InputFileTypes.PNG
      || fileType == InputFileTypes.PNM || fileType == InputFileTypes.TIFF;
00248
00249             this.OwnerContext = context;
00250
00251             DataHandle = GCHandle.Alloc(data, GCHandleType.Pinned);
00252             IntPtr dataAddress = DataHandle.Value.AddrOfPinnedObject();
00253             ulong dataLength = (ulong)data.Length;
00254
00255             float xRes = 0;
00256             float yRes = 0;
00257
00258             ExitCodes result =
      (ExitCodes)NativeMethods.CreateDocumentFromStream(context.NativeContext, dataAddress, dataLength,
      FileTypeMagics[(int)fileType], isImage ? 1 : 0, ref NativeDocument, ref NativeStream, ref PageCount,
      ref xRes, ref yRes);
00259
00260             if (xRes > 72)
00261             {
00262                 this.ImageXRes = xRes;
00263             }
00264             else
00265             {
00266                 this.ImageXRes = 72;
00267             }
00268
00269             if (yRes > 72)
00270             {
00271                 this.ImageYRes = yRes;
00272             }
00273             else
00274             {
00275                 this.ImageYRes = 72;
00276             }
00277
00278             switch (result)
00279             {
00280                 case ExitCodes.EXIT_SUCCESS:
00281                     break;
00282                 case ExitCodes.ERR_CANNOT_OPEN_STREAM:
00283                     throw new MuPDFException("Cannot open data stream", result);
00284                 case ExitCodes.ERR_CANNOT_OPEN_FILE:
00285                     throw new MuPDFException("Cannot open document", result);
00286                 case ExitCodes.ERR_CANNOT_COUNT_PAGES:
00287                     throw new MuPDFException("Cannot count pages", result);
00288                 default:
00289                     throw new MuPDFException("Unknown error", result);
00290             }
```

```
00291
00292             if (NativeMethods.CheckIfPasswordNeeded(context.NativeContext, this.NativeDocument) != 0)
00293             {
00294                 this.EncryptionState = EncryptionState.Encrypted;
00295             }
00296             else
00297             {
00298                 this.EncryptionState = EncryptionState.Unencrypted;
00299             }
00300
00301             int permissions = NativeMethods.GetPermissions(context.NativeContext,
      this.NativeDocument);
00302
00303             int restrictions = 0;
00304
00305             if ((permissions & 1) == 0)
00306             {
00307                 restrictions |= 1;
00308             }
00309
00310             if ((permissions & 2) == 0)
00311             {
00312                 restrictions |= 2;
00313             }
00314
00315             if ((permissions & 4) == 0)
00316             {
00317                 restrictions |= 4;
00318             }
00319
00320             if ((permissions & 8) == 0)
00321             {
00322                 restrictions |= 8;
00323             }
00324
00325             if (restrictions == 0)
00326             {
00327                 this.Restrictions = DocumentRestrictions.None;
00328                 this.RestrictionState = RestrictionState.Unrestricted;
00329             }
00330             else
00331             {
00332                 this.Restrictions = (DocumentRestrictions)restrictions;
00333                 this.RestrictionState = RestrictionState.Restricted;
00334             }
00335
00336             Pages = new MuPDFPageCollection(context, this, PageCount);
00337             DisplayLists = new MuPDFDisplayList[PageCount];
00338         }
00339
00340         /// <summary>
00341         /// Create a new <see cref="MuPDFDocument"/> from a <see cref="MemoryStream"/>.
00342         /// </summary>
00343         /// <param name="context">The context that will own this document.</param>
00344         /// <param name="data">The <see cref="MemoryStream"/> containing the data that makes up the
      document. This will be disposed when the <see cref="MuPDFDocument"/> has been disposed and must not
      be disposed externally!
00345         /// The address of the <see cref="MemoryStream"/>'s buffer will be pinned, which may cause
      degradation in the Garbage Collector's performance, and is thus only advised for short-lived
      documents. To avoid this issue, marshal the bytes to unmanaged memory and use one of the <see
      cref="IntPtr"/> constructors.</param>
00346         /// <param name="fileType">The type of the document to read.</param>
00347         public MuPDFDocument(MuPDFContext context, ref MemoryStream data, InputFileTypes fileType)
00348         {
00349             bool isImage = fileType == InputFileTypes.BMP || fileType == InputFileTypes.GIF ||
      fileType == InputFileTypes.JPEG || fileType == InputFileTypes.PAM || fileType == InputFileTypes.PNG
      || fileType == InputFileTypes.PNM || fileType == InputFileTypes.TIFF;
00350
00351             this.OwnerContext = context;
00352
00353             int origin = (int)data.Seek(0, SeekOrigin.Begin);
00354             ulong dataLength = (ulong)data.Length;
00355             byte[] dataBytes = data.GetBuffer();
00356
00357             DataHandle = GCHandle.Alloc(dataBytes, GCHandleType.Pinned);
00358             IntPtr dataAddress = IntPtr.Add(DataHandle.Value.AddrOfPinnedObject(), origin);
00359
00360             DataHolder = data;
00361
00362             float xRes = 0;
00363             float yRes = 0;
00364
00365             ExitCodes result =
      (ExitCodes)NativeMethods.CreateDocumentFromStream(context.NativeContext, dataAddress, dataLength,
      FileTypeMagics[(int)fileType], isImage ? 1 : 0, ref NativeDocument, ref NativeStream, ref PageCount,
      ref xRes, ref yRes);
00366
```

```
00367             if (xRes > 72)
00368             {
00369                 this.ImageXRes = xRes;
00370             }
00371             else
00372             {
00373                 this.ImageXRes = 72;
00374             }
00375 
00376             if (yRes > 72)
00377             {
00378                 this.ImageYRes = yRes;
00379             }
00380             else
00381             {
00382                 this.ImageYRes = 72;
00383             }
00384 
00385 
00386             switch (result)
00387             {
00388                 case ExitCodes.EXIT_SUCCESS:
00389                     break;
00390                 case ExitCodes.ERR_CANNOT_OPEN_STREAM:
00391                     throw new MuPDFException("Cannot open data stream", result);
00392                 case ExitCodes.ERR_CANNOT_OPEN_FILE:
00393                     throw new MuPDFException("Cannot open document", result);
00394                 case ExitCodes.ERR_CANNOT_COUNT_PAGES:
00395                     throw new MuPDFException("Cannot count pages", result);
00396                 default:
00397                     throw new MuPDFException("Unknown error", result);
00398             }
00399 
00400             if (NativeMethods.CheckIfPasswordNeeded(context.NativeContext, this.NativeDocument) != 0)
00401             {
00402                 this.EncryptionState = EncryptionState.Encrypted;
00403             }
00404             else
00405             {
00406                 this.EncryptionState = EncryptionState.Unencrypted;
00407             }
00408 
00409             int permissions = NativeMethods.GetPermissions(context.NativeContext,
      this.NativeDocument);
00410 
00411             int restrictions = 0;
00412 
00413             if ((permissions & 1) == 0)
00414             {
00415                 restrictions |= 1;
00416             }
00417 
00418             if ((permissions & 2) == 0)
00419             {
00420                 restrictions |= 2;
00421             }
00422 
00423             if ((permissions & 4) == 0)
00424             {
00425                 restrictions |= 4;
00426             }
00427 
00428             if ((permissions & 8) == 0)
00429             {
00430                 restrictions |= 8;
00431             }
00432 
00433             if (restrictions == 0)
00434             {
00435                 this.Restrictions = DocumentRestrictions.None;
00436                 this.RestrictionState = RestrictionState.Unrestricted;
00437             }
00438             else
00439             {
00440                 this.Restrictions = (DocumentRestrictions)restrictions;
00441                 this.RestrictionState = RestrictionState.Restricted;
00442             }
00443 
00444             Pages = new MuPDFPageCollection(context, this, PageCount);
00445             DisplayLists = new MuPDFDisplayList[PageCount];
00446         }
00447 
00448         /// <summary>
00449         /// Create a new <see cref="MuPDFDocument"/> from a file.
00450         /// </summary>
00451         /// <param name="context">The context that will own this document.</param>
00452         /// <param name="fileName">The path to the file to open.</param>
```

```
00453         public MuPDFDocument(MuPDFContext context, string fileName)
00454         {
00455             bool isImage;
00456 
00457             string extension = Path.GetExtension(fileName).ToLowerInvariant();
00458 
00459             switch (extension)
00460             {
00461                 case ".bmp":
00462                 case ".dib":
00463 
00464                 case ".gif":
00465 
00466                 case ".jpg":
00467                 case ".jpeg":
00468                 case ".jpe":
00469                 case ".jif":
00470                 case ".jfif":
00471                 case ".jfi":
00472 
00473                 case ".pam":
00474                 case ".pbm":
00475                 case ".pgm":
00476                 case ".ppm":
00477                 case ".pnm":
00478 
00479                 case ".png":
00480 
00481                 case ".tif":
00482                 case ".tiff":
00483                     isImage = true;
00484                     break;
00485                 default:
00486                     isImage = false;
00487                     break;
00488             }
00489 
00490 
00491             this.OwnerContext = context;
00492 
00493             float xRes = 0;
00494             float yRes = 0;
00495 
00496             ExitCodes result;
00497 
00498             using (UTF8EncodedString encodedFileName = new UTF8EncodedString(fileName))
00499             {
00500                 result = (ExitCodes)NativeMethods.CreateDocumentFromFile(context.NativeContext,
      encodedFileName.Address, isImage ? 1 : 0, ref NativeDocument, ref PageCount, ref xRes, ref yRes);
00501             }
00502 
00503             if (xRes > 72)
00504             {
00505                 this.ImageXRes = xRes;
00506             }
00507             else
00508             {
00509                 this.ImageXRes = 72;
00510             }
00511 
00512             if (yRes > 72)
00513             {
00514                 this.ImageYRes = yRes;
00515             }
00516             else
00517             {
00518                 this.ImageYRes = 72;
00519             }
00520 
00521             switch (result)
00522             {
00523                 case ExitCodes.EXIT_SUCCESS:
00524                     break;
00525                 case ExitCodes.ERR_CANNOT_OPEN_FILE:
00526                     throw new MuPDFException("Cannot open document", result);
00527                 case ExitCodes.ERR_CANNOT_COUNT_PAGES:
00528                     throw new MuPDFException("Cannot count pages", result);
00529                 default:
00530                     throw new MuPDFException("Unknown error", result);
00531             }
00532 
00533             if (NativeMethods.CheckIfPasswordNeeded(context.NativeContext, this.NativeDocument) != 0)
00534             {
00535                 this.EncryptionState = EncryptionState.Encrypted;
00536             }
00537             else
00538             {
```

```
00539                 this.EncryptionState = EncryptionState.Unencrypted;
00540             }
00541
00542             int permissions = NativeMethods.GetPermissions(context.NativeContext,
      this.NativeDocument);
00543
00544             int restrictions = 0;
00545
00546             if ((permissions & 1) == 0)
00547             {
00548                 restrictions |= 1;
00549             }
00550
00551             if ((permissions & 2) == 0)
00552             {
00553                 restrictions |= 2;
00554             }
00555
00556             if ((permissions & 4) == 0)
00557             {
00558                 restrictions |= 4;
00559             }
00560
00561             if ((permissions & 8) == 0)
00562             {
00563                 restrictions |= 8;
00564             }
00565
00566             if (restrictions == 0)
00567             {
00568                 this.Restrictions = DocumentRestrictions.None;
00569                 this.RestrictionState = RestrictionState.Unrestricted;
00570             }
00571             else
00572             {
00573                 this.Restrictions = (DocumentRestrictions)restrictions;
00574                 this.RestrictionState = RestrictionState.Restricted;
00575             }
00576
00577             Pages = new MuPDFPageCollection(context, this, PageCount);
00578             DisplayLists = new MuPDFDisplayList[PageCount];
00579         }
00580
00581         /// <summary>
00582         /// Discard all the display lists that have been loaded from the document, possibly freeing
      some memory in the case of a huge document.
00583         /// </summary>
00584         public void ClearCache()
00585         {
00586             for (int i = 0; i < PageCount; i++)
00587             {
00588                 DisplayLists[i]?.Dispose();
00589                 DisplayLists[i] = null;
00590             }
00591         }
00592
00593         /// <summary>
00594         /// Render (part of) a page to an array of bytes.
00595         /// </summary>
00596         /// <param name="pageNumber">The number of the page to render (starting at 0).</param>
00597         /// <param name="region">The region of the page to render in page units.</param>
00598         /// <param name="zoom">The scale at which the page will be rendered. This will determine the
      size in pixel of the image.</param>
00599         /// <param name="pixelFormat">The format of the pixel data.</param>
00600         /// <param name="includeAnnotations">If this is <see langword="true" />, annotations (e.g.
      signatures) are included in the display list that is generated. Otherwise, only the page contents are
      included.</param>
00601         /// <returns>A byte array containing the raw values for the pixels of the rendered
      image.</returns>
00602         public byte[] Render(int pageNumber, Rectangle region, double zoom, PixelFormats pixelFormat,
      bool includeAnnotations = true)
00603         {
00604             if (this.EncryptionState == EncryptionState.Encrypted)
00605             {
00606                 throw new DocumentLockedException("A password is necessary to render the document!");
00607             }
00608
00609             int bufferSize = MuPDFDocument.GetRenderedSize(region, zoom, pixelFormat);
00610
00611             byte[] buffer = new byte[bufferSize];
00612
00613             GCHandle bufferHandle = GCHandle.Alloc(buffer, GCHandleType.Pinned);
00614             IntPtr bufferPointer = bufferHandle.AddrOfPinnedObject();
00615
00616             try
00617             {
00618                 Render(pageNumber, region, zoom, pixelFormat, bufferPointer, includeAnnotations);
```

```
00619             }
00620             finally
00621             {
00622                 bufferHandle.Free();
00623             }
00624 
00625             return buffer;
00626         }
00627 
00628         /// <summary>
00629         /// Render a page to an array of bytes.
00630         /// </summary>
00631         /// <param name="pageNumber">The number of the page to render (starting at 0).</param>
00632         /// <param name="zoom">The scale at which the page will be rendered. This will determine the
      size in pixel of the image.</param>
00633         /// <param name="pixelFormat">The format of the pixel data.</param>
00634         /// <param name="includeAnnotations">If this is <see langword="true" />, annotations (e.g.
      signatures) are included in the display list that is generated. Otherwise, only the page contents are
      included.</param>
00635         /// <returns>A byte array containing the raw values for the pixels of the rendered
      image.</returns>
00636         public byte[] Render(int pageNumber, double zoom, PixelFormats pixelFormat, bool
      includeAnnotations = true)
00637         {
00638             if (this.EncryptionState == EncryptionState.Encrypted)
00639             {
00640                 throw new DocumentLockedException("A password is necessary to render the document!");
00641             }
00642 
00643             Rectangle region = this.Pages[pageNumber].Bounds;
00644             return Render(pageNumber, region, zoom, pixelFormat, includeAnnotations);
00645         }
00646 
00647         /// <summary>
00648         /// Render (part of) a page to the specified destination.
00649         /// </summary>
00650         /// <param name="pageNumber">The number of the page to render (starting at 0).</param>
00651         /// <param name="region">The region of the page to render in page units.</param>
00652         /// <param name="zoom">The scale at which the page will be rendered. This will determine the
      size in pixel of the image.</param>
00653         /// <param name="pixelFormat">The format of the pixel data.</param>
00654         /// <param name="destination">The address of the buffer where the pixel data will be written.
      There must be enough space available to write the values for all the pixels, otherwise this will fail
      catastrophically!</param>
00655         /// <param name="includeAnnotations">If this is <see langword="true" />, annotations (e.g.
      signatures) are included in the display list that is generated. Otherwise, only the page contents are
      included.</param>
00656         public void Render(int pageNumber, Rectangle region, double zoom, PixelFormats pixelFormat,
      IntPtr destination, bool includeAnnotations = true)
00657         {
00658             if (this.EncryptionState == EncryptionState.Encrypted)
00659             {
00660                 throw new DocumentLockedException("A password is necessary to render the document!");
00661             }
00662 
00663             if (DisplayLists[pageNumber] == null)
00664             {
00665                 DisplayLists[pageNumber] = new MuPDFDisplayList(this.OwnerContext,
      this.Pages[pageNumber], includeAnnotations);
00666             }
00667 
00668             if (zoom < 0.000001 | zoom * region.Width <= 0.001 || zoom * region.Height <= 0.001)
00669             {
00670                 throw new ArgumentOutOfRangeException(nameof(zoom), zoom, "The zoom factor is too
      small!");
00671             }
00672 
00673             if (this.ImageXRes != 72 || this.ImageYRes != 72)
00674             {
00675                 zoom *= Math.Sqrt(this.ImageXRes * this.ImageYRes) / 72;
00676                 region = new Rectangle(region.X0 * 72 / this.ImageXRes, region.Y0 * 72 /
      this.ImageYRes, region.X1 * 72 / this.ImageXRes, region.Y1 * 72 / this.ImageYRes);
00677             }
00678 
00679             float fzoom = (float)zoom;
00680 
00681             ExitCodes result =
      (ExitCodes)NativeMethods.RenderSubDisplayList(OwnerContext.NativeContext,
      DisplayLists[pageNumber].NativeDisplayList, region.X0, region.Y0, region.X1, region.Y1, fzoom,
      (int)pixelFormat, destination, IntPtr.Zero);
00682 
00683             switch (result)
00684             {
00685                 case ExitCodes.EXIT_SUCCESS:
00686                     break;
00687                 case ExitCodes.ERR_CANNOT_RENDER:
00688                     throw new MuPDFException("Cannot render page", result);
```

```
00689                 default:
00690                     throw new MuPDFException("Unknown error", result);
00691             }
00692 
00693             RoundedRectangle roundedRegion = region.Round(fzoom);
00694             RoundedSize roundedSize = new RoundedSize(roundedRegion.Width, roundedRegion.Height);
00695 
00696             if (pixelFormat == PixelFormats.RGBA || pixelFormat == PixelFormats.BGRA)
00697             {
00698                 Utils.UnpremultiplyAlpha(destination, roundedSize);
00699             }
00700 
00701             if (this.ClipToPageBounds &&
      !Pages[pageNumber].Bounds.Contains(DisplayLists[pageNumber].Bounds.Intersect(region)))
00702             {
00703                 Utils.ClipImage(destination, roundedSize, region, Pages[pageNumber].Bounds,
      pixelFormat);
00704             }
00705         }
00706 
00707         /// <summary>
00708         /// Render a page to the specified destination.
00709         /// </summary>
00710         /// <param name="pageNumber">The number of the page to render (starting at 0).</param>
00711         /// <param name="zoom">The scale at which the page will be rendered. This will determine the
      size in pixel of the image.</param>
00712         /// <param name="pixelFormat">The format of the pixel data.</param>
00713         /// <param name="destination">The address of the buffer where the pixel data will be written.
      There must be enough space available to write the values for all the pixels, otherwise this will fail
      catastrophically!</param>
00714         /// <param name="includeAnnotations">If this is <see langword="true" />, annotations (e.g.
      signatures) are included in the display list that is generated. Otherwise, only the page contents are
      included.</param>
00715         public void Render(int pageNumber, double zoom, PixelFormats pixelFormat, IntPtr destination,
      bool includeAnnotations = true)
00716         {
00717             if (this.EncryptionState == EncryptionState.Encrypted)
00718             {
00719                 throw new DocumentLockedException("A password is necessary to render the document!");
00720             }
00721 
00722             Rectangle region = this.Pages[pageNumber].Bounds;
00723             Render(pageNumber, region, zoom, pixelFormat, destination, includeAnnotations);
00724         }
00725 
00726         /// <summary>
00727         /// Render (part of) a page to a <see cref="Span{T}">Span</see>&lt;<see cref="byte"/>&gt;.
00728         /// </summary>
00729         /// <param name="pageNumber">The number of the page to render (starting at 0).</param>
00730         /// <param name="region">The region of the page to render in page units.</param>
00731         /// <param name="zoom">The scale at which the page will be rendered. This will determine the
      size in pixel of the image.</param>
00732         /// <param name="pixelFormat">The format of the pixel data.</param>
00733         /// <param name="disposable">An <see cref="IDisposable"/> that can be used to free the memory
      where the image is stored. You should keep track of this and dispose it when you have finished
      working with the image.</param>
00734         /// <param name="includeAnnotations">If this is <see langword="true" />, annotations (e.g.
      signatures) are included in the display list that is generated. Otherwise, only the page contents are
      included.</param>
00735         public Span<byte> Render(int pageNumber, Rectangle region, double zoom, PixelFormats
      pixelFormat, out IDisposable disposable, bool includeAnnotations = true)
00736         {
00737             if (this.EncryptionState == EncryptionState.Encrypted)
00738             {
00739                 throw new DocumentLockedException("A password is necessary to render the document!");
00740             }
00741 
00742             int dataSize = GetRenderedSize(region, zoom, pixelFormat);
00743 
00744             IntPtr destination = Marshal.AllocHGlobal(dataSize);
00745             disposable = new DisposableIntPtr(destination, dataSize);
00746 
00747             this.Render(pageNumber, region, zoom, pixelFormat, destination, includeAnnotations);
00748 
00749             unsafe
00750             {
00751                 return new Span<byte>((void*)destination, dataSize);
00752             }
00753         }
00754 
00755         /// <summary>
00756         /// Render a page to a <see cref="Span{T}">Span</see>&lt;<see cref="byte"/>&gt;.
00757         /// </summary>
00758         /// <param name="pageNumber">The number of the page to render (starting at 0).</param>
00759         /// <param name="zoom">The scale at which the page will be rendered. This will determine the
      size in pixel of the image.</param>
00760         /// <param name="pixelFormat">The format of the pixel data.</param>
```

```
00761         /// <param name="disposable">An <see cref="IDisposable"/> that can be used to free the memory
      where the image is stored. You should keep track of this and dispose it when you have finished
      working with the image.</param>
00762         /// <param name="includeAnnotations">If this is <see langword="true" />, annotations (e.g.
      signatures) are included in the display list that is generated. Otherwise, only the page contents are
      included.</param>
00763         public Span<byte> Render(int pageNumber, double zoom, PixelFormats pixelFormat, out
      IDisposable disposable, bool includeAnnotations = true)
00764         {
00765             if (this.EncryptionState == EncryptionState.Encrypted)
00766             {
00767                 throw new DocumentLockedException("A password is necessary to render the document!");
00768             }
00769 
00770             Rectangle region = this.Pages[pageNumber].Bounds;
00771             return Render(pageNumber, region, zoom, pixelFormat, out disposable, includeAnnotations);
00772         }
00773 
00774 
00775         /// <summary>
00776         /// Create a new <see cref="MuPDFMultiThreadedPageRenderer"/> that renders the specified page
      with the specified number of threads.
00777         /// </summary>
00778         /// <param name="pageNumber">The number of the page to render (starting at 0).</param>
00779         /// <param name="threadCount">The number of threads to use. This must be factorisable using
      only powers of 2, 3, 5 or 7. Otherwise, the biggest number smaller than <paramref
      name="threadCount"/> that satisfies this condition is used.</param>
00780         /// <returns>A <see cref="MuPDFMultiThreadedPageRenderer"/> that can be used to render the
      specified page with the specified number of threads.</returns>
00781         /// <param name="includeAnnotations">If this is <see langword="true" />, annotations (e.g.
      signatures) are included in the display list that is generated. Otherwise, only the page contents are
      included.</param>
00782         public MuPDFMultiThreadedPageRenderer GetMultiThreadedRenderer(int pageNumber, int
      threadCount, bool includeAnnotations = true)
00783         {
00784             if (this.EncryptionState == EncryptionState.Encrypted)
00785             {
00786                 throw new DocumentLockedException("A password is necessary to render the document!");
00787             }
00788 
00789             if (DisplayLists[pageNumber] == null)
00790             {
00791                 DisplayLists[pageNumber] = new MuPDFDisplayList(this.OwnerContext,
      this.Pages[pageNumber], includeAnnotations);
00792             }
00793 
00794             return new MuPDFMultiThreadedPageRenderer(OwnerContext, DisplayLists[pageNumber],
      threadCount, Pages[pageNumber].Bounds, this.ClipToPageBounds, this.ImageXRes, this.ImageYRes);
00795         }
00796 
00797         /// <summary>
00798         /// Determine how many bytes will be necessary to render the specified page at the specified
      zoom level, using the the specified pixel format.
00799         /// </summary>
00800         /// <param name="pageNumber">The number of the page to render (starting at 0).</param>
00801         /// <param name="zoom">The scale at which the page will be rendered. This will determine the
      size in pixel of the image.</param>
00802         /// <param name="pixelFormat">The format of the pixels data.</param>
00803         /// <returns>An integer representing the number of bytes that will be necessary to store the
      pixel data of the rendered image.</returns>
00804         public int GetRenderedSize(int pageNumber, double zoom, PixelFormats pixelFormat)
00805         {
00806             if (this.EncryptionState == EncryptionState.Encrypted)
00807             {
00808                 throw new DocumentLockedException("A password is necessary to render the document!");
00809             }
00810 
00811             return GetRenderedSize(Pages[pageNumber].Bounds, zoom, pixelFormat);
00812         }
00813 
00814         /// <summary>
00815         /// Determine how many bytes will be necessary to render the specified region in page units at
      the specified zoom level, using the the specified pixel format.
00816         /// </summary>
00817         /// <param name="region">The region that will be rendered.</param>
00818         /// <param name="zoom">The scale at which the region will be rendered. This will determine the
      size in pixel of the image.</param>
00819         /// <param name="pixelFormat">The format of the pixels data.</param>
00820         /// <returns>An integer representing the number of bytes that will be necessary to store the
      pixel data of the rendered image.</returns>
00821         public static int GetRenderedSize(Rectangle region, double zoom, PixelFormats pixelFormat)
00822         {
00823             float x0 = region.X0 * (float)zoom;
00824             float y0 = region.Y0 * (float)zoom;
00825             float x1 = region.X1 * (float)zoom;
00826             float y1 = region.Y1 * (float)zoom;
00827 
```

```
00828             Rectangle scaledRect = new Rectangle(x0, y0, x1, y1);
00829             RoundedRectangle bounds = scaledRect.Round();
00830 
00831             int width = bounds.Width;
00832             int height = bounds.Height;
00833 
00834             switch (pixelFormat)
00835             {
00836                 case PixelFormats.RGB:
00837                 case PixelFormats.BGR:
00838                     return width * height * 3;
00839                 case PixelFormats.RGBA:
00840                 case PixelFormats.BGRA:
00841                     return width * height * 4;
00842             }
00843 
00844             return -1;
00845         }
00846 
00847         /// <summary>
00848         /// Save (part of) a page to an image file in the specified format.
00849         /// </summary>
00850         /// <param name="pageNumber">The number of the page to render (starting at 0).</param>
00851         /// <param name="region">The region of the page to render in page units.</param>
00852         /// <param name="zoom">The scale at which the page will be rendered. This will determine the
      size in pixel of the image.</param>
00853         /// <param name="pixelFormat">The format of the pixel data.</param>
00854         /// <param name="fileName">The path to the output file.</param>
00855         /// <param name="fileType">The output format of the file.</param>
00856         /// <param name="includeAnnotations">If this is <see langword="true" />, annotations (e.g.
      signatures) are included in the display list that is generated. Otherwise, only the page contents are
      included.</param>
00857         public void SaveImage(int pageNumber, Rectangle region, double zoom, PixelFormats pixelFormat,
      string fileName, RasterOutputFileTypes fileType, bool includeAnnotations = true)
00858         {
00859             if (this.EncryptionState == EncryptionState.Encrypted)
00860             {
00861                 throw new DocumentLockedException("A password is necessary to render the document!");
00862             }
00863 
00864             if (pixelFormat == PixelFormats.RGBA && fileType == RasterOutputFileTypes.PNM)
00865             {
00866                 throw new ArgumentException("Cannot save an image with alpha channel in PNM format!",
      nameof(fileType));
00867             }
00868 
00869             if (DisplayLists[pageNumber] == null)
00870             {
00871                 DisplayLists[pageNumber] = new MuPDFDisplayList(this.OwnerContext,
      this.Pages[pageNumber], includeAnnotations);
00872             }
00873 
00874             if (zoom < 0.000001 | zoom * region.Width <= 0.001 || zoom * region.Height <= 0.001)
00875             {
00876                 throw new ArgumentOutOfRangeException(nameof(zoom), zoom, "The zoom factor is too
      small!");
00877             }
00878 
00879             if (this.ImageXRes != 72 || this.ImageYRes != 72)
00880             {
00881                 zoom *= Math.Sqrt(this.ImageXRes * this.ImageYRes) / 72;
00882                 region = new Rectangle(region.X0 * 72 / this.ImageXRes, region.Y0 * 72 /
      this.ImageYRes, region.X1 * 72 / this.ImageXRes, region.Y1 * 72 / this.ImageYRes);
00883             }
00884 
00885             float fzoom = (float)zoom;
00886 
00887             ExitCodes result;
00888 
00889             using (UTF8EncodedString encodedFileName = new UTF8EncodedString(fileName))
00890             {
00891                 result = (ExitCodes)NativeMethods.SaveImage(OwnerContext.NativeContext,
      DisplayLists[pageNumber].NativeDisplayList, region.X0, region.Y0, region.X1, region.Y1, fzoom,
      (int)pixelFormat, encodedFileName.Address, (int)fileType);
00892             }
00893 
00894             switch (result)
00895             {
00896                 case ExitCodes.EXIT_SUCCESS:
00897                     break;
00898                 case ExitCodes.ERR_CANNOT_RENDER:
00899                     throw new MuPDFException("Cannot render page", result);
00900                 case ExitCodes.ERR_CANNOT_SAVE:
00901                     throw new MuPDFException("Cannot save to the output file", result);
00902                 default:
00903                     throw new MuPDFException("Unknown error", result);
00904             }
```

```
00905         }
00906
00907         /// <summary>
00908         /// Save a page to an image file in the specified format.
00909         /// </summary>
00910         /// <param name="pageNumber">The number of the page to render (starting at 0).</param>
00911         /// <param name="zoom">The scale at which the page will be rendered. This will determine the
      size in pixel of the image.</param>
00912         /// <param name="pixelFormat">The format of the pixel data.</param>
00913         /// <param name="fileName">The path to the output file.</param>
00914         /// <param name="fileType">The output format of the file.</param>
00915         /// <param name="includeAnnotations">If this is <see langword="true" />, annotations (e.g.
      signatures) are included in the display list that is generated. Otherwise, only the page contents are
      included.</param>
00916         public void SaveImage(int pageNumber, double zoom, PixelFormats pixelFormat, string fileName,
      RasterOutputFileTypes fileType, bool includeAnnotations = true)
00917         {
00918             if (this.EncryptionState == EncryptionState.Encrypted)
00919             {
00920                 throw new DocumentLockedException("A password is necessary to render the document!");
00921             }
00922
00923             Rectangle region = this.Pages[pageNumber].Bounds;
00924             SaveImage(pageNumber, region, zoom, pixelFormat, fileName, fileType, includeAnnotations);
00925         }
00926
00927         /// <summary>
00928         /// Write (part of) a page to an image stream in the specified format.
00929         /// </summary>
00930         /// <param name="pageNumber">The number of the page to render (starting at 0).</param>
00931         /// <param name="region">The region of the page to render in page units.</param>
00932         /// <param name="zoom">The scale at which the page will be rendered. This will determine the
      size in pixel of the image.</param>
00933         /// <param name="pixelFormat">The format of the pixel data.</param>
00934         /// <param name="outputStream">The stream to which the image data will be written.</param>
00935         /// <param name="fileType">The output format of the image.</param>
00936         /// <param name="includeAnnotations">If this is <see langword="true" />, annotations (e.g.
      signatures) are included in the display list that is generated. Otherwise, only the page contents are
      included.</param>
00937         public void WriteImage(int pageNumber, Rectangle region, double zoom, PixelFormats
      pixelFormat, Stream outputStream, RasterOutputFileTypes fileType, bool includeAnnotations = true)
00938         {
00939             if (this.EncryptionState == EncryptionState.Encrypted)
00940             {
00941                 throw new DocumentLockedException("A password is necessary to render the document!");
00942             }
00943
00944             if (pixelFormat == PixelFormats.RGBA && fileType == RasterOutputFileTypes.PNM)
00945             {
00946                 throw new ArgumentException("Cannot save an image with alpha channel in PNM format!",
      nameof(fileType));
00947             }
00948
00949             if (DisplayLists[pageNumber] == null)
00950             {
00951                 DisplayLists[pageNumber] = new MuPDFDisplayList(this.OwnerContext,
      this.Pages[pageNumber], includeAnnotations);
00952             }
00953
00954             if (zoom < 0.000001 | zoom * region.Width <= 0.001 || zoom * region.Height <= 0.001)
00955             {
00956                 throw new ArgumentOutOfRangeException(nameof(zoom), zoom, "The zoom factor is too
      small!");
00957             }
00958
00959             if (this.ImageXRes != 72 || this.ImageYRes != 72)
00960             {
00961                 zoom *= Math.Sqrt(this.ImageXRes * this.ImageYRes) / 72;
00962                 region = new Rectangle(region.X0 * 72 / this.ImageXRes, region.Y0 * 72 /
      this.ImageYRes, region.X1 * 72 / this.ImageXRes, region.Y1 * 72 / this.ImageYRes);
00963             }
00964
00965             float fzoom = (float)zoom;
00966
00967             IntPtr outputBuffer = IntPtr.Zero;
00968             IntPtr outputData = IntPtr.Zero;
00969             ulong outputDataLength = 0;
00970
00971             ExitCodes result = (ExitCodes)NativeMethods.WriteImage(OwnerContext.NativeContext,
      DisplayLists[pageNumber].NativeDisplayList, region.X0, region.Y0, region.X1, region.Y1, fzoom,
      (int)pixelFormat, (int)fileType, ref outputBuffer, ref outputData, ref outputDataLength);
00972
00973             switch (result)
00974             {
00975                 case ExitCodes.EXIT_SUCCESS:
00976                     break;
00977                 case ExitCodes.ERR_CANNOT_RENDER:
```

```
00978                   throw new MuPDFException("Cannot render page", result);
00979               case ExitCodes.ERR_CANNOT_CREATE_CONTEXT:
00980                   throw new MuPDFException("Cannot create the output buffer", result);
00981               default:
00982                   throw new MuPDFException("Unknown error", result);
00983           }
00984
00985           byte[] buffer = new byte[1024];
00986
00987           while (outputDataLength > 0)
00988           {
00989               int bytesToCopy = (int)Math.Min(buffer.Length, (long)outputDataLength);
00990               Marshal.Copy(outputData, buffer, 0, bytesToCopy);
00991               outputData = IntPtr.Add(outputData, bytesToCopy);
00992               outputStream.Write(buffer, 0, bytesToCopy);
00993               outputDataLength -= (ulong)bytesToCopy;
00994           }
00995
00996           NativeMethods.DisposeBuffer(OwnerContext.NativeContext, outputBuffer);
00997       }
00998
00999       /// <summary>
01000       /// Write a page to an image stream in the specified format.
01001       /// </summary>
01002       /// <param name="pageNumber">The number of the page to render (starting at 0).</param>
01003       /// <param name="zoom">The scale at which the page will be rendered. This will determine the
      size in pixel of the image.</param>
01004       /// <param name="pixelFormat">The format of the pixel data.</param>
01005       /// <param name="outputStream">The stream to which the image data will be written.</param>
01006       /// <param name="fileType">The output format of the image.</param>
01007       /// <param name="includeAnnotations">If this is <see langword="true" />, annotations (e.g.
      signatures) are included in the display list that is generated. Otherwise, only the page contents are
      included.</param>
01008       public void WriteImage(int pageNumber, double zoom, PixelFormats pixelFormat, Stream
      outputStream, RasterOutputFileTypes fileType, bool includeAnnotations = true)
01009       {
01010           if (this.EncryptionState == EncryptionState.Encrypted)
01011           {
01012               throw new DocumentLockedException("A password is necessary to render the document!");
01013           }
01014
01015           Rectangle region = this.Pages[pageNumber].Bounds;
01016           WriteImage(pageNumber, region, zoom, pixelFormat, outputStream, fileType,
      includeAnnotations);
01017       }
01018
01019       /// <summary>
01020       /// Create a new document containing the specified (parts of) pages from other documents.
01021       /// </summary>
01022       /// <param name="context">The context that was used to open the documents.</param>
01023       /// <param name="fileName">The output file name.</param>
01024       /// <param name="fileType">The output file format.</param>
01025       /// <param name="includeAnnotations">If this is <see langword="true" />, annotations (e.g.
      signatures) are included in the display list that is generated. Otherwise, only the page contents are
      included.</param>
01026       /// <param name="pages">The pages to include in the document. The "page" element specifies the
      page, the "region" element the area of the page that should be included in the document, and the
      "zoom" element how much the region should be scaled.</param>
01027       public static void CreateDocument(MuPDFContext context, string fileName,
      DocumentOutputFileTypes fileType, bool includeAnnotations = true, params (MuPDFPage page, Rectangle
      region, float zoom)[] pages)
01028       {
01029           if (fileType == DocumentOutputFileTypes.SVG && pages.Length > 1)
01030           {
01031               //Actually, you can, but the library creates multiple files appending numbers after
      each name (e.g. page1.svg, page2.svg, ...), which is ugly and may have unintended consequences.
01032               //If you really want to do this, you can call this method multiple times.
01033               throw new ArgumentException("You cannot create an SVG document with more than one
      page!", nameof(pages));
01034           }
01035
01036           string originalFileName = fileName;
01037
01038           if (fileType == DocumentOutputFileTypes.SVG)
01039           {
01040               //For SVG documents, the library annoyingly alters the output file name, appending a
      "1" just before the extension (e.g. document.svg -> document1.svg). Since users may not be expecting
      this, it is best to render to a temporary file and then move it to the specified location.
01041               fileName = Path.GetTempFileName();
01042           }
01043
01044           IntPtr documentWriter = IntPtr.Zero;
01045
01046           ExitCodes result;
01047
01048           // Encode the file name in UTF-8 in unmanaged memory.
01049           using (UTF8EncodedString encodedFileName = new UTF8EncodedString(fileName))
```

```
01050             {
01051                 //Initialise document writer.
01052                 result = (ExitCodes)NativeMethods.CreateDocumentWriter(context.NativeContext,
      encodedFileName.Address, (int)fileType, ref documentWriter);
01053             }
01054 
01055             switch (result)
01056             {
01057                 case ExitCodes.EXIT_SUCCESS:
01058                     break;
01059                 case ExitCodes.ERR_CANNOT_CREATE_WRITER:
01060                     throw new MuPDFException("Cannot create the document writer", result);
01061                 default:
01062                     throw new MuPDFException("Unknown error", result);
01063             }
01064 
01065             //Write pages.
01066             for (int i = 0; i < pages.Length; i++)
01067             {
01068                 MuPDFDocument doc = pages[i].page.OwnerDocument;
01069                 int pageNum = pages[i].page.PageNumber;
01070 
01071                 if (doc.DisplayLists[pageNum] == null)
01072                 {
01073                     doc.DisplayLists[pageNum] = new MuPDFDisplayList(doc.OwnerContext,
      doc.Pages[pageNum], includeAnnotations);
01074                 }
01075 
01076                 Rectangle region = pages[i].region;
01077                 double zoom = pages[i].zoom;
01078 
01079                 if (pages[i].page.OwnerDocument.ImageXRes != 72 ||
      pages[i].page.OwnerDocument.ImageYRes != 72)
01080                 {
01081                     zoom *= Math.Sqrt(pages[i].page.OwnerDocument.ImageXRes *
      pages[i].page.OwnerDocument.ImageYRes) / 72;
01082                     region = new Rectangle(region.X0 * 72 / pages[i].page.OwnerDocument.ImageXRes,
      region.Y0 * 72 / pages[i].page.OwnerDocument.ImageYRes, region.X1 * 72 /
      pages[i].page.OwnerDocument.ImageXRes, region.Y1 * 72 / pages[i].page.OwnerDocument.ImageYRes);
01083                 }
01084 
01085                 result = (ExitCodes)NativeMethods.WriteSubDisplayListAsPage(context.NativeContext,
      doc.DisplayLists[pageNum].NativeDisplayList, region.X0, region.Y0, region.X1, region.Y1, (float)zoom,
      documentWriter);
01086 
01087                 switch (result)
01088                 {
01089                     case ExitCodes.EXIT_SUCCESS:
01090                         break;
01091                     case ExitCodes.ERR_CANNOT_RENDER:
01092                         throw new MuPDFException("Cannot render page " + i.ToString(), result);
01093                     default:
01094                         throw new MuPDFException("Unknown error", result);
01095                 }
01096             }
01097 
01098             //Close and dispose the document writer.
01099             result = (ExitCodes)NativeMethods.FinalizeDocumentWriter(context.NativeContext,
      documentWriter);
01100 
01101             switch (result)
01102             {
01103                 case ExitCodes.EXIT_SUCCESS:
01104                     break;
01105                 case ExitCodes.ERR_CANNOT_CLOSE_DOCUMENT:
01106                     throw new MuPDFException("Cannot finalise the document", result);
01107                 default:
01108                     throw new MuPDFException("Unknown error", result);
01109             }
01110 
01111             if (fileType == DocumentOutputFileTypes.SVG)
01112             {
01113                 //Move the temporary file to the location specified by the user.
01114                 //The library has altered the temporary file name by appending a "1" before the
      extension.
01115                 string tempFileName = Path.Combine(Path.GetDirectoryName(fileName),
      Path.GetFileNameWithoutExtension(fileName) + "1" + Path.GetExtension(fileName));
01116 
01117                 //Overwrite existing file.
01118                 if (File.Exists(originalFileName))
01119                 {
01120                     File.Delete(originalFileName);
01121                 }
01122 
01123                 File.Move(tempFileName, originalFileName);
01124             }
01125         }
```

```
01126
01127         /// <summary>
01128         /// Create a new document containing the specified pages from other documents.
01129         /// </summary>
01130         /// <param name="context">The context that was used to open the documents.</param>
01131         /// <param name="fileName">The output file name.</param>
01132         /// <param name="fileType">The output file format.</param>
01133         /// <param name="pages">The pages to include in the document.</param>
01134         /// <param name="includeAnnotations">If this is <see langword="true" />, annotations (e.g.
      signatures) are included in the display list that is generated. Otherwise, only the page contents are
      included.</param>
01135         public static void CreateDocument(MuPDFContext context, string fileName,
      DocumentOutputFileTypes fileType, bool includeAnnotations = true, params MuPDFPage[] pages)
01136         {
01137             (MuPDFPage, Rectangle, float)[] boundedPages = new (MuPDFPage, Rectangle,
      float)[pages.Length];
01138
01139             for (int i = 0; i < pages.Length; i++)
01140             {
01141                 boundedPages[i] = (pages[i], pages[i].Bounds, 1);
01142             }
01143
01144             CreateDocument(context, fileName, fileType, includeAnnotations, boundedPages);
01145         }
01146
01147
01148         /// <summary>
01149         /// Creates a new <see cref="MuPDFStructuredTextPage"/> from the specified page. This contains
      information about the text layout that can be used for highlighting and searching. The reading order
      is taken from the order the text is drawn in the source file, so may not be accurate.
01150         /// </summary>
01151         /// <param name="pageNumber">The number of the page (starting at 0)</param>
01152         /// <param name="includeAnnotations">If this is <see langword="true" />, annotations (e.g.
      signatures) are included. Otherwise, only the page contents are included.</param>
01153         /// <returns>A <see cref="MuPDFStructuredTextPage"/> containing a structured text
      representation of the page.</returns>
01154         public MuPDFStructuredTextPage GetStructuredTextPage(int pageNumber, bool includeAnnotations =
      true)
01155         {
01156             if (this.EncryptionState == EncryptionState.Encrypted)
01157             {
01158                 throw new DocumentLockedException("A password is necessary to render the document!");
01159             }
01160
01161             if (DisplayLists[pageNumber] == null)
01162             {
01163                 DisplayLists[pageNumber] = new MuPDFDisplayList(this.OwnerContext,
      this.Pages[pageNumber], includeAnnotations);
01164             }
01165
01166             return new MuPDFStructuredTextPage(this.OwnerContext, this.DisplayLists[pageNumber], null,
      1, new Rectangle());
01167         }
01168
01169         /// <summary>
01170         /// Creates a new <see cref="MuPDFStructuredTextPage"/> from the specified page, using optical
      character recognition (OCR) to determine what text is written on the image. This contains information
      about the text layout that can be used for highlighting and searching.
01171         /// </summary>
01172         /// <param name="pageNumber">The number of the page (starting at 0)</param>
01173         /// <param name="ocrLanguage">The language to use for optical character recognition (OCR). If
      this is null, no OCR is performed.</param>
01174         /// <param name="includeAnnotations">If this is <see langword="true" />, annotations (e.g.
      signatures) are included. Otherwise, only the page contents are included.</param>
01175         /// <param name="cancellationToken">A <see cref="CancellationToken"/> used to cancel the
      operation. Providing a value other than the default is not supported on Windows x86 and will throw a
      runtime exception.</param>
01176         /// <param name="progress">An <see cref="IProgress{OCRProgressInfo}"/> used to report
      progress. Providing a value other than null is not supported on Windows x86 and will throw a runtime
      exception.</param>
01177         /// <returns>A <see cref="MuPDFStructuredTextPage"/> containing a structured text
      representation of the page.</returns>
01178         public MuPDFStructuredTextPage GetStructuredTextPage(int pageNumber, TesseractLanguage
      ocrLanguage, bool includeAnnotations = true, CancellationToken cancellationToken = default,
      IProgress<OCRProgressInfo> progress = null)
01179         {
01180             if (this.EncryptionState == EncryptionState.Encrypted)
01181             {
01182                 throw new DocumentLockedException("A password is necessary to render the document!");
01183             }
01184
01185             if (DisplayLists[pageNumber] == null)
01186             {
01187                 DisplayLists[pageNumber] = new MuPDFDisplayList(this.OwnerContext,
      this.Pages[pageNumber], includeAnnotations);
01188             }
01189
```

```
01190             double zoom = 1;
01191             Rectangle region = this.Pages[pageNumber].Bounds;
01192 
01193             if (this.ImageXRes != 72 || this.ImageYRes != 72)
01194             {
01195                 zoom *= Math.Sqrt(this.ImageXRes * this.ImageYRes) / 72;
01196                 region = new Rectangle(region.X0 * 72 / this.ImageXRes, region.Y0 * 72 /
      this.ImageYRes, region.X1 * 72 / this.ImageXRes, region.Y1 * 72 / this.ImageYRes);
01197             }
01198 
01199             return new MuPDFStructuredTextPage(this.OwnerContext, this.DisplayLists[pageNumber],
      ocrLanguage, zoom, region, cancellationToken, progress);
01200         }
01201 
01202         /// <summary>
01203         /// Creates a new <see cref="MuPDFStructuredTextPage"/> from the specified page, using optical
      character recognition (OCR) to determine what text is written on the image. This contains information
      about the text layout that can be used for highlighting and searching. The OCR step is run
      asynchronously, e.g. to avoid blocking the UI thread.
01204         /// </summary>
01205         /// <param name="pageNumber">The number of the page (starting at 0)</param>
01206         /// <param name="ocrLanguage">The language to use for optical character recognition (OCR). If
      this is null, no OCR is performed.</param>
01207         /// <param name="includeAnnotations">If this is <see langword="true" />, annotations (e.g.
      signatures) are included. Otherwise, only the page contents are included.</param>
01208         /// <param name="cancellationToken">A <see cref="CancellationToken"/> used to cancel the
      operation. Providing a value other than the default is not supported on Windows x86 and will throw a
      runtime exception.</param>
01209         /// <param name="progress">An <see cref="IProgress{OCRProgressInfo}"/> used to report
      progress. Providing a value other than null is not supported on Windows x86 and will throw a runtime
      exception.</param>
01210         /// <returns>A <see cref="MuPDFStructuredTextPage"/> containing a structured text
      representation of the page.</returns>
01211         public async Task<MuPDFStructuredTextPage> GetStructuredTextPageAsync(int pageNumber,
      TesseractLanguage ocrLanguage, bool includeAnnotations = true, CancellationToken cancellationToken =
      default, IProgress<OCRProgressInfo> progress = null)
01212         {
01213             if (this.EncryptionState == EncryptionState.Encrypted)
01214             {
01215                 throw new DocumentLockedException("A password is necessary to render the document!");
01216             }
01217 
01218             if (DisplayLists[pageNumber] == null)
01219             {
01220                 DisplayLists[pageNumber] = new MuPDFDisplayList(this.OwnerContext,
      this.Pages[pageNumber], includeAnnotations);
01221             }
01222 
01223             double zoom = 1;
01224             Rectangle region = this.Pages[pageNumber].Bounds;
01225 
01226             if (this.ImageXRes != 72 || this.ImageYRes != 72)
01227             {
01228                 zoom *= Math.Sqrt(this.ImageXRes * this.ImageYRes) / 72;
01229                 region = new Rectangle(region.X0 * 72 / this.ImageXRes, region.Y0 * 72 /
      this.ImageYRes, region.X1 * 72 / this.ImageXRes, region.Y1 * 72 / this.ImageYRes);
01230             }
01231 
01232             return await Task.Run(() => new MuPDFStructuredTextPage(this.OwnerContext,
      this.DisplayLists[pageNumber], ocrLanguage, zoom, region, cancellationToken, progress));
01233         }
01234 
01235         /// <summary>
01236         /// Extracts all the text from the document and returns it as a <see cref="string"/>. The
      reading order is taken from the order the text is drawn in the source file, so may not be accurate.
01237         /// </summary>
01238         /// <param name="separator">The character(s) used to separate the text lines obtained from the
      document. If this is <see langword="null" />, <see cref="Environment.NewLine"/> is used as a default
      separator.</param>
01239         /// <param name="includeAnnotations">If this is <see langword="true" />, annotations (e.g.
      signatures) are included. Otherwise, only the page contents are included.</param>
01240         /// <returns>A <see cref="string"/> containing all the text in the document. Characters are
      converted from the UTF-8 representation used in the document to equivalent UTF-16 <see
      cref="string"/>s.</returns>
01241         public string ExtractText(string separator = null, bool includeAnnotations = true)
01242         {
01243             if (this.EncryptionState == EncryptionState.Encrypted)
01244             {
01245                 throw new DocumentLockedException("A password is necessary to render the document!");
01246             }
01247 
01248             separator = separator ?? Environment.NewLine;
01249 
01250             var text = new StringBuilder();
01251             bool started = false;
01252 
01253             for (int i = 0; i < this.Pages.Count; i++)
```

```
01254             {
01255                 MuPDFStructuredTextPage structuredTextPage = this.GetStructuredTextPage(i,
    includeAnnotations);
01256                 foreach (MuPDFStructuredTextBlock textBlock in
    structuredTextPage.StructuredTextBlocks)
01257                 {
01258                     var numLines = textBlock.Count;
01259                     for (var j = 0; j < numLines; j++)
01260                     {
01261                         if (!string.IsNullOrWhiteSpace(textBlock[j].Text))
01262                         {
01263                             if (started)
01264                             {
01265                                 text.Append(separator);
01266                             }
01267                             else
01268                             {
01269                                 started = true;
01270                             }
01271 
01272                             text.Append(textBlock[j].Text);
01273                         }
01274                     }
01275                 }
01276             }
01277 
01278             return text.ToString();
01279         }
01280 
01281         /// <summary>
01282         /// Extracts all the text from the document and returns it as a <see cref="string"/>, using
    optical character recognition (OCR) to determine what text is written on the image.
01283         /// </summary>
01284         /// <param name="separator">The character(s) used to separate the text lines obtained from the
    document. If this is <see langword="null" />, <see cref="Environment.NewLine"/> is used as a default
    separator.</param>
01285         /// <param name="ocrLanguage">The language to use for optical character recognition (OCR). If
    this is null, no OCR is performed.</param>
01286         /// <param name="includeAnnotations">If this is <see langword="true" />, annotations (e.g.
    signatures) are included. Otherwise, only the page contents are included.</param>
01287         /// <returns>A <see cref="string"/> containing all the text in the document. Characters are
    converted from the UTF-8 representation used in the document to equivalent UTF-16 <see
    cref="string"/>s.</returns>
01288         public string ExtractText(TesseractLanguage ocrLanguage, string separator = null, bool
    includeAnnotations = true)
01289         {
01290             if (this.EncryptionState == EncryptionState.Encrypted)
01291             {
01292                 throw new DocumentLockedException("A password is necessary to render the document!");
01293             }
01294 
01295             separator = separator ?? Environment.NewLine;
01296 
01297             var text = new StringBuilder();
01298             bool started = false;
01299 
01300             for (int i = 0; i < this.Pages.Count; i++)
01301             {
01302                 MuPDFStructuredTextPage structuredTextPage = this.GetStructuredTextPage(i,
    ocrLanguage, includeAnnotations);
01303                 foreach (MuPDFStructuredTextBlock textBlock in
    structuredTextPage.StructuredTextBlocks)
01304                 {
01305                     var numLines = textBlock.Count;
01306                     for (var j = 0; j < numLines; j++)
01307                     {
01308                         if (!string.IsNullOrWhiteSpace(textBlock[j].Text))
01309                         {
01310                             if (started)
01311                             {
01312                                 text.Append(separator);
01313                             }
01314                             else
01315                             {
01316                                 started = true;
01317                             }
01318 
01319                             text.Append(textBlock[j].Text);
01320                         }
01321                     }
01322                 }
01323             }
01324 
01325             return text.ToString();
01326         }
01327 
01328         /// <summary>
```

```
01329         /// Extracts all the text from the document and returns it as a <see cref="string"/>, using optical character recognition (OCR) to determine what text is written on the image. The OCR step is run asynchronously, e.g. to avoid blocking the UI thread.
01330         /// </summary>
01331         /// <param name="separator">The character(s) used to separate the text lines obtained from the document. If this is <see langword="null" />, <see cref="Environment.NewLine"/> is used as a default separator.</param>
01332         /// <param name="ocrLanguage">The language to use for optical character recognition (OCR). If this is null, no OCR is performed.</param>
01333         /// <param name="includeAnnotations">If this is <see langword="true" />, annotations (e.g. signatures) are included. Otherwise, only the page contents are included.</param>
01334         /// <param name="cancellationToken">A <see cref="CancellationToken"/> used to cancel the operation.</param>
01335         /// <param name="progress">An <see cref="IProgress{OCRProgressInfo}"/> used to report progress.</param>
01336         /// <returns>A <see cref="string"/> containing all the text in the document. Characters are converted from the UTF-8 representation used in the document to equivalent UTF-16 <see cref="string"/>s.</returns>
01337         public async Task<string> ExtractTextAsync(TesseractLanguage ocrLanguage, string separator = null, bool includeAnnotations = true, CancellationToken cancellationToken = default, IProgress<OCRProgressInfo> progress = null)
01338         {
01339             if (this.EncryptionState == EncryptionState.Encrypted)
01340             {
01341                 throw new DocumentLockedException("A password is necessary to render the document!");
01342             }
01343 
01344             separator = separator ?? Environment.NewLine;
01345 
01346             var text = new StringBuilder();
01347             bool started = false;
01348 
01349             for (int i = 0; i < this.Pages.Count; i++)
01350             {
01351                 MuPDFStructuredTextPage structuredTextPage = await this.GetStructuredTextPageAsync(i, ocrLanguage, includeAnnotations, cancellationToken, progress);
01352                 foreach (MuPDFStructuredTextBlock textBlock in structuredTextPage.StructuredTextBlocks)
01353                 {
01354                     var numLines = textBlock.Count;
01355                     for (var j = 0; j < numLines; j++)
01356                     {
01357                         if (!string.IsNullOrWhiteSpace(textBlock[j].Text))
01358                         {
01359                             if (started)
01360                             {
01361                                 text.Append(separator);
01362                             }
01363                             else
01364                             {
01365                                 started = true;
01366                             }
01367 
01368                             text.Append(textBlock[j].Text);
01369                         }
01370                     }
01371                 }
01372             }
01373 
01374             return text.ToString();
01375         }
01376 
01377         /// <summary>
01378         /// Attempts to unlock the document with the supplied password.
01379         /// </summary>
01380         /// <param name="password">The user or owner password to use to unlock the document.</param>
01381         /// <returns><see langword="true"/>If the document was successfully unlocked (or if it was never locked to begin with), <see langword="false"/> if the password was incorrect and the document is still locked.</returns>
01382         /// <remarks>This method can be used both to unlock an encrypted document and to check whether the supplied owner password is correct.</remarks>
01383         public bool TryUnlock(string password)
01384         {
01385             return TryUnlock(password, out _);
01386         }
01387 
01388         /// <summary>
01389         /// Attempts to unlock the document with the supplied password.
01390         /// </summary>
01391         /// <param name="password">The user or owner password to use to unlock the document.</param>
01392         /// <param name="passwordType">If the method returns true, this can be used to determine whether the supplied password was the user password or the owner password. If the method returns <see langword="false"/>,
01393         /// this can be used to determine whether a user password and/or an owner password are required.</param>
01394         /// <returns><see langword="true"/>If the document was successfully unlocked (or if it was never locked to begin with), <see langword="false"/> if the password was incorrect and the document
```

```
      is still locked.</returns>
01395         /// <remarks>This method can be used both to unlock an encrypted document and to check whether
      the supplied owner password is correct.</remarks>
01396         public bool TryUnlock(string password, out PasswordTypes passwordType)
01397         {
01398             int result = NativeMethods.UnlockWithPassword(this.OwnerContext.NativeContext,
      this.NativeDocument, password);
01399
01400             int pt = 0;
01401
01402             switch (result)
01403             {
01404                 case 0:
01405                     pt = 0;
01406
01407                     if (this.EncryptionState == EncryptionState.Encrypted)
01408                     {
01409                         pt |= 1;
01410                     }
01411
01412                     if (this.RestrictionState == RestrictionState.Restricted)
01413                     {
01414                         pt |= 2;
01415                     }
01416
01417                     passwordType = (PasswordTypes)pt;
01418                     return !(this.EncryptionState == EncryptionState.Encrypted ||
      this.RestrictionState == RestrictionState.Restricted);
01419                 case 1:
01420                     passwordType = PasswordTypes.None;
01421                     return true;
01422                 case 2:
01423                     if (this.EncryptionState == EncryptionState.Encrypted)
01424                     {
01425                         this.EncryptionState = EncryptionState.Unlocked;
01426                     }
01427                     passwordType = PasswordTypes.User;
01428                     return true;
01429                 case 4:
01430                     if (this.RestrictionState == RestrictionState.Restricted)
01431                     {
01432                         this.RestrictionState = RestrictionState.Unlocked;
01433                     }
01434                     passwordType = PasswordTypes.Owner;
01435                     return true;
01436                 case 6:
01437                     pt = 0;
01438
01439                     if (this.EncryptionState == EncryptionState.Encrypted)
01440                     {
01441                         this.EncryptionState = EncryptionState.Unlocked;
01442                         pt |= 1;
01443                     }
01444
01445                     if (this.RestrictionState == RestrictionState.Restricted)
01446                     {
01447                         this.RestrictionState = RestrictionState.Unlocked;
01448                         pt |= 2;
01449                     }
01450                     passwordType = (PasswordTypes)pt;
01451                     return true;
01452                 default:
01453                     throw new ArgumentOutOfRangeException("Unexpected return value when unlocking the
      document: " + result.ToString());
01454             }
01455         }
01456
01457
01458         private bool disposedValue;
01459
01460         ///<inheritdoc/>
01461         protected virtual void Dispose(bool disposing)
01462         {
01463             if (!disposedValue)
01464             {
01465                 if (disposing)
01466                 {
01467                     Pages.Dispose();
01468                     foreach (MuPDFDisplayList list in DisplayLists)
01469                     {
01470                         list?.Dispose();
01471                     }
01472                     DataHandle?.Free();
01473                     DataHolder?.Dispose();
01474                 }
01475
01476                 NativeMethods.DisposeDocument(OwnerContext.NativeContext, NativeDocument);
```

```
01477
01478                 if (NativeStream != IntPtr.Zero)
01479                 {
01480                     NativeMethods.DisposeStream(OwnerContext.NativeContext, NativeStream);
01481                 }
01482
01483                 disposedValue = true;
01484             }
01485         }
01486
01487         ///<inheritdoc/>
01488         ~MuPDFDocument()
01489         {
01490             Dispose(disposing: false);
01491         }
01492
01493         ///<inheritdoc/>
01494         public void Dispose()
01495         {
01496             Dispose(disposing: true);
01497             GC.SuppressFinalize(this);
01498         }
01499     }
01500 }
```

8.8 MuPDFMultiThreadedPageRenderer.cs

```
00001 /*
00002     MuPDFCore - A set of multiplatform .NET Core bindings for MuPDF.
00003     Copyright (C) 2020  Giorgio Bianchini
00004
00005     This program is free software: you can redistribute it and/or modify
00006     it under the terms of the GNU Affero General Public License as
00007     published by the Free Software Foundation, version 3.
00008
00009     This program is distributed in the hope that it will be useful,
00010     but WITHOUT ANY WARRANTY; without even the implied warranty of
00011     MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.  See the
00012     GNU Affero General Public License for more details.
00013
00014     You should have received a copy of the GNU Affero General Public License
00015     along with this program.  If not, see <http://www.gnu.org/licenses/>
00016 */
00017
00018 using System;
00019 using System.Collections.Generic;
00020 using System.Linq;
00021 using System.Runtime.InteropServices;
00022 using System.Threading;
00023
00024 namespace MuPDFCore
00025 {
00026     /// <summary>
00027     /// A reusable thread to render part of an image.
00028     /// </summary>
00029     internal class RenderingThread : IDisposable
00030     {
00031         /// <summary>
00032         /// A class to hold the data used internally by the rendering thread.
00033         /// </summary>
00034         private class RenderData
00035         {
00036             public IntPtr Context;
00037             public MuPDFDisplayList DisplayList;
00038             public Rectangle Region;
00039             public float Zoom;
00040             public IntPtr PixelStorage;
00041             public Rectangle PageBounds;
00042             public PixelFormats PixelFormat;
00043             public bool ClipToPageBounds;
00044         }
00045
00046         /// <summary>
00047         /// A lock object to prevent race conditions.
00048         /// </summary>
00049         private readonly object RenderDataLock;
00050
00051         /// <summary>
00052         /// The data used internally by the rendering thread.
00053         /// </summary>
00054         private readonly RenderData CurrentRenderData;
00055
00056         /// <summary>
```

```
00057         /// The actual thread that does the rendering.
00058         /// </summary>
00059         private readonly Thread Thread;
00060 
00061         /// <summary>
00062         /// An <see cref="EventWaitHandle"/> that is set by the <see cref="Thread"/> when it finished
      rendering.
00063         /// </summary>
00064         private readonly EventWaitHandle SignalFromThread;
00065 
00066         /// <summary>
00067         /// An <see cref="EventWaitHandle"/> that signals to the <see cref="Thread"/> that it should
      start rendering.
00068         /// </summary>
00069         private readonly EventWaitHandle SignalToThread;
00070 
00071         /// <summary>
00072         /// An <see cref="EventWaitHandle"/> that signals that the object is being disposed and all
      activity should cease.
00073         /// </summary>
00074         private readonly EventWaitHandle DisposeSignal;
00075 
00076         /// <summary>
00077         /// A pointer to a <see cref="Cookie"/> object that can be used to monitor the progress of the
      rendering or to abort it.
00078         /// </summary>
00079         private readonly IntPtr Cookie;
00080 
00081         /// <summary>
00082         /// Performs the actual rendering.
00083         /// </summary>
00084         private void RenderAction()
00085         {
00086             ExitCodes result =
      (ExitCodes)NativeMethods.RenderSubDisplayList(this.CurrentRenderData.Context,
      this.CurrentRenderData.DisplayList.NativeDisplayList, this.CurrentRenderData.Region.X0,
      this.CurrentRenderData.Region.Y0, this.CurrentRenderData.Region.X1, this.CurrentRenderData.Region.Y1,
      this.CurrentRenderData.Zoom, (int)this.CurrentRenderData.PixelFormat,
      this.CurrentRenderData.PixelStorage, Cookie);
00087 
00088             switch (result)
00089             {
00090                 case ExitCodes.EXIT_SUCCESS:
00091                     break;
00092                 case ExitCodes.ERR_CANNOT_RENDER:
00093                     throw new MuPDFException("Cannot render page", result);
00094                 default:
00095                     throw new MuPDFException("Unknown error", result);
00096             }
00097 
00098             RoundedRectangle roundedRegion =
      this.CurrentRenderData.Region.Round(this.CurrentRenderData.Zoom);
00099             RoundedSize roundedSize = new RoundedSize(roundedRegion.Width, roundedRegion.Height);
00100 
00101             if (this.CurrentRenderData.PixelFormat == PixelFormats.RGBA ||
      this.CurrentRenderData.PixelFormat == PixelFormats.BGRA)
00102             {
00103                 Utils.UnpremultiplyAlpha(this.CurrentRenderData.PixelStorage, roundedSize);
00104             }
00105 
00106             if (this.CurrentRenderData.ClipToPageBounds &&
      !this.CurrentRenderData.PageBounds.Contains(this.CurrentRenderData.DisplayList.Bounds.Intersect(this.CurrentRenderData
00107             {
00108                 Utils.ClipImage(this.CurrentRenderData.PixelStorage, roundedSize,
      this.CurrentRenderData.Region, this.CurrentRenderData.PageBounds,
      this.CurrentRenderData.PixelFormat);
00109             }
00110         }
00111 
00112         /// <summary>
00113         /// Create a new <see cref="RenderingThread"/> instance.
00114         /// </summary>
00115         public RenderingThread()
00116         {
00117             //Initialize fields
00118             SignalFromThread = new EventWaitHandle(false, EventResetMode.ManualReset);
00119             SignalToThread = new EventWaitHandle(false, EventResetMode.ManualReset);
00120             DisposeSignal = new EventWaitHandle(false, EventResetMode.ManualReset);
00121 
00122             CurrentRenderData = new RenderData();
00123             RenderDataLock = new object();
00124 
00125             //Allocate unmanaged memory to hold the cookie.
00126             Cookie = Marshal.AllocHGlobal(Marshal.SizeOf<MuPDFCore.Cookie>());
00127 
00128             //Initialise the rendering thread.
00129             this.Thread = new Thread(() =>
```

```
00130             {
00131                 EventWaitHandle[] handles = new EventWaitHandle[] { SignalToThread, DisposeSignal };
00132 
00133                 while (true)
00134                 {
00135                     int handle = EventWaitHandle.WaitAny(handles);
00136 
00137                     if (handle == 0)
00138                     {
00139                         SignalToThread.Reset();
00140 
00141                         lock (RenderDataLock)
00142                         {
00143                             this.RenderAction();
00144                         }
00145 
00146                         SignalFromThread.Set();
00147                     }
00148                     else
00149                     {
00150                         SignalFromThread.Set();
00151                         break;
00152                     }
00153                 }
00154             });
00155 
00156             //Start the rendering thread.
00157             this.Thread.Start();
00158         }
00159 
00160         /// <summary>
00161         /// Start rendering a region of a display list to the specified destination.
00162         /// </summary>
00163         /// <param name="context">The rendering context.</param>
00164         /// <param name="displayList">The native display list that should be rendered.</param>
00165         /// <param name="region">The region that should be rendered.</param>
00166         /// <param name="zoom">The scale at which the region will be rendered. This will determine the
      size in pixel of the image.</param>
00167         /// <param name="pixelStorage">The address of the buffer where the pixel data will be written.
      There must be enough space available to write the values for all the pixels, otherwise this will fail
      catastrophically!</param>
00168         /// <param name="pixelFormat">The format of the pixel data.</param>
00169         /// <param name="pageBounds">The bounds of the page being rendererd.</param>
00170         /// <param name="clipToPageBounds">A boolean value indicating whether the rendered image
      should be clipped to the original page's bounds. This can be relevant if the page has been "cropped"
      by altering its mediabox, but otherwise leaving the contents untouched.</param>
00171         public void Render(IntPtr context, MuPDFDisplayList displayList, Rectangle region, float zoom,
      IntPtr pixelStorage, PixelFormats pixelFormat, Rectangle pageBounds, bool clipToPageBounds)
00172         {
00173             lock (RenderDataLock)
00174             {
00175                 //Reset the cookie.
00176                 unsafe
00177                 {
00178                     Cookie* cookie = (Cookie*)Cookie;
00179 
00180                     cookie->abort = 0;
00181                     cookie->errors = 0;
00182                     cookie->incomplete = 0;
00183                     cookie->progress = 0;
00184                     cookie->progress_max = 0;
00185                 }
00186 
00187                 //Set up all the rendering data.
00188                 CurrentRenderData.Context = context;
00189                 CurrentRenderData.DisplayList = displayList;
00190                 CurrentRenderData.Region = region;
00191                 CurrentRenderData.Zoom = zoom;
00192                 CurrentRenderData.PixelStorage = pixelStorage;
00193                 CurrentRenderData.PixelFormat = pixelFormat;
00194                 CurrentRenderData.PageBounds = pageBounds;
00195                 CurrentRenderData.ClipToPageBounds = clipToPageBounds;
00196                 SignalToThread.Set();
00197             }
00198         }
00199 
00200         /// <summary>
00201         /// Wait until the current rendering operation finishes.
00202         /// </summary>
00203         public void WaitForRendering()
00204         {
00205             EventWaitHandle[] handles = new EventWaitHandle[] { SignalFromThread, DisposeSignal };
00206             int result = EventWaitHandle.WaitAny(handles);
00207             if (result == 0)
00208             {
00209                 SignalFromThread.Reset();
00210             }
```

```
00211         }
00212
00213         /// <summary>
00214         /// Abort the current rendering operation.
00215         /// </summary>
00216         public void AbortRendering()
00217         {
00218             lock (RenderDataLock)
00219             {
00220                 unsafe
00221                 {
00222                     Cookie* cookie = (Cookie*)Cookie;
00223                     cookie->abort = 1;
00224                 }
00225             }
00226         }
00227
00228         /// <summary>
00229         /// Get the progress of the current rendering operation.
00230         /// </summary>
00231         /// <returns>A <see cref="RenderProgress.ThreadRenderProgress"/> object containing the
      progress of the current rendering operation.</returns>
00232         public RenderProgress.ThreadRenderProgress GetProgress()
00233         {
00234             int progress;
00235             ulong maxProgress;
00236
00237             unsafe
00238             {
00239                 Cookie* cookie = (Cookie*)Cookie;
00240
00241                 progress = cookie->progress;
00242                 maxProgress = cookie->progress_max;
00243             }
00244
00245             return new RenderProgress.ThreadRenderProgress(progress, maxProgress);
00246         }
00247
00248         private bool disposedValue;
00249
00250         protected virtual void Dispose(bool disposing)
00251         {
00252             if (!disposedValue)
00253             {
00254                 if (disposing)
00255                 {
00256                     DisposeSignal.Set();
00257                     Thread.Join();
00258                 }
00259
00260                 Marshal.FreeHGlobal(Cookie);
00261
00262                 disposedValue = true;
00263             }
00264         }
00265
00266         public void Dispose()
00267         {
00268             Dispose(disposing: true);
00269             GC.SuppressFinalize(this);
00270         }
00271     }
00272
00273     /// <summary>
00274     /// A class that holds the necessary resources to render a page of a MuPDF document using multiple
      threads.
00275     /// </summary>
00276     public class MuPDFMultiThreadedPageRenderer : IDisposable
00277     {
00278         /// <summary>
00279         /// The display list that is rendered by this renderer.
00280         /// </summary>
00281         private readonly MuPDFDisplayList DisplayList;
00282
00283         /// <summary>
00284         /// The cloned contexts that are used by the <see cref="RenderingThreads"/> to render the
      display list.
00285         /// </summary>
00286         private readonly MuPDFContext[] Contexts;
00287
00288         /// <summary>
00289         /// The <see cref="RenderingThreads"/> that are in charge of the actual rendering.
00290         /// </summary>
00291         private readonly RenderingThread[] RenderingThreads;
00292
00293         /// <summary>
00294         /// The bounds of the page being rendered.
```

```
00295         /// </summary>
00296         private readonly Rectangle PageBounds;
00297 
00298         /// <summary>
00299         /// Whether the rendered images should be clipped to the bounds of the page being rendered.
00300         /// </summary>
00301         private readonly bool ClipToPageBounds;
00302 
00303         /// <summary>
00304         /// The number of threads that are used to render the image.
00305         /// </summary>
00306         public int ThreadCount { get; }
00307 
00308         /// <summary>
00309         /// If the document is an image, the horizontal resolution of the image. Otherwise, 72.
00310         /// </summary>
00311         internal double ImageXRes = double.NaN;
00312 
00313         /// <summary>
00314         /// If the document is an image, the vertical resolution of the image. Otherwise, 72.
00315         /// </summary>
00316         internal double ImageYRes = double.NaN;
00317 
00318         /// <summary>
00319         /// Create a new <see cref="MuPDFMultiThreadedPageRenderer"/> from a specified display list
    using the specified number of threads.
00320         /// </summary>
00321         /// <param name="context">The context that owns the document from which the display list was
    extracted.</param>
00322         /// <param name="displayList">The display list to render.</param>
00323         /// <param name="threadCount">The number of threads to use in the rendering. This must be
    factorisable using only powers of 2, 3, 5 or 7. Otherwise, the biggest number smaller than <paramref
    name="threadCount"/> that satisfies this condition is used.</param>
00324         /// <param name="pageBounds">The bounds of the page being rendererd.</param>
00325         /// <param name="clipToPageBounds">A boolean value indicating whether the rendered image
    should be clipped to the original page's bounds. This can be relevant if the page has been "cropped"
    by altering its mediabox, but otherwise leaving the contents untouched.</param>
00326         /// <param name="imageXRes">If the document is an image, the horizontal resolution of the
    image. Otherwise, 72.</param>
00327         /// <param name="imageYRes">If the document is an image, the vertical resolution of the image.
    Otherwise, 72.</param>
00328         internal MuPDFMultiThreadedPageRenderer(MuPDFContext context, MuPDFDisplayList displayList,
    int threadCount, Rectangle pageBounds, bool clipToPageBounds, double imageXRes, double imageYRes)
00329         {
00330             threadCount = Utils.GetAcceptableNumber(threadCount);
00331 
00332             this.ThreadCount = threadCount;
00333             this.DisplayList = displayList;
00334             this.PageBounds = pageBounds;
00335             this.ClipToPageBounds = clipToPageBounds;
00336 
00337             this.ImageXRes = imageXRes;
00338             this.ImageYRes = imageYRes;
00339 
00340             IntPtr[] contexts = new IntPtr[threadCount];
00341             GCHandle contextsHandle = GCHandle.Alloc(contexts, GCHandleType.Pinned);
00342 
00343             try
00344             {
00345                 ExitCodes result = (ExitCodes)NativeMethods.CloneContext(context.NativeContext,
    threadCount, contextsHandle.AddrOfPinnedObject());
00346 
00347                 switch (result)
00348                 {
00349                     case ExitCodes.EXIT_SUCCESS:
00350                         break;
00351                     case ExitCodes.ERR_CANNOT_INIT_MUTEX:
00352                         throw new MuPDFException("Cannot initalize mutex objects", result);
00353                     case ExitCodes.ERR_CANNOT_CREATE_CONTEXT:
00354                         throw new MuPDFException("Cannot create master context", result);
00355                     case ExitCodes.ERR_CANNOT_CLONE_CONTEXT:
00356                         throw new MuPDFException("Cannot create context clones", result);
00357                     default:
00358                         throw new MuPDFException("Unknown error", result);
00359                 }
00360 
00361                 Contexts = new MuPDFContext[threadCount];
00362                 RenderingThreads = new RenderingThread[threadCount];
00363                 for (int i = 0; i < threadCount; i++)
00364                 {
00365                     Contexts[i] = new MuPDFContext(contexts[i]);
00366                     RenderingThreads[i] = new RenderingThread();
00367                 }
00368             }
00369             finally
00370             {
00371                 contextsHandle.Free();
```

```
00372             }
00373         }
00374 
00375         /// <summary>
00376         /// Render the specified region to an image of the specified size, split in a number of tiles
      equal to the number of threads used by this <see cref="MuPDFMultiThreadedPageRenderer"/>, without
      marshaling. This method will not return until all the rendering threads have finished.
00377         /// </summary>
00378         /// <param name="targetSize">The total size of the image that should be rendered.</param>
00379         /// <param name="region">The region in page units that should be rendered.</param>
00380         /// <param name="destinations">An array containing the addresses of the buffers where the
      rendered tiles will be written. There must be enough space available in each buffer to write the
      values for all the pixels of the tile, otherwise this will fail catastrophically!
00381         /// As long as the <paramref name="targetSize"/> is the same, the size in pixel of the tiles
      is guaranteed to also be the same.</param>
00382         /// <param name="pixelFormat">The format of the pixel data.</param>
00383         public void Render(RoundedSize targetSize, Rectangle region, IntPtr[] destinations,
      PixelFormats pixelFormat)
00384         {
00385             if (destinations.Length != Contexts.Length)
00386             {
00387                 throw new ArgumentOutOfRangeException(nameof(destinations), destinations.Length, "The
      number of destinations must be equal to the number of rendering threads!");
00388             }
00389 
00390             RoundedRectangle[] targets = targetSize.Split(destinations.Length);
00391 
00392             float zoomX = targetSize.Width / region.Width;
00393             float zoomY = targetSize.Height / region.Height;
00394 
00395             float zoom = (float)Math.Sqrt(zoomX * zoomY);
00396 
00397             Rectangle actualPageArea = new Rectangle(region.X0, region.Y0, region.X0 +
      targetSize.Width / zoom, region.Y0 + targetSize.Height / zoom);
00398 
00399             Rectangle[] origins = actualPageArea.Split(destinations.Length);
00400 
00401             //Make sure that each tile has the expected size in pixel, rounding errors
      notwithstanding.
00402             for (int i = 0; i < origins.Length; i++)
00403             {
00404                 int countBlanks = 0;
00405                 RoundedRectangle roundedOrigin = origins[i].Round(zoom);
00406                 while (roundedOrigin.Width != targets[i].Width || roundedOrigin.Height !=
      targets[i].Height)
00407                 {
00408                     RoundedRectangle oldRoundedOrigin = roundedOrigin;
00409 
00410                     if (roundedOrigin.Width > targets[i].Width)
00411                     {
00412                         if (origins[i].X0 > actualPageArea.X0)
00413                         {
00414                             origins[i] = new Rectangle(origins[i].X0 + 0.5 / zoom, origins[i].Y0,
      origins[i].X1, origins[i].Y1);
00415                         }
00416                         else
00417                         {
00418                             origins[i] = new Rectangle(origins[i].X0, origins[i].Y0, origins[i].X1 -
      0.5 / zoom, origins[i].Y1);
00419                         }
00420                     }
00421                     else if (roundedOrigin.Width < targets[i].Width)
00422                     {
00423                         if (origins[i].X1 < actualPageArea.X1)
00424                         {
00425                             origins[i] = new Rectangle(origins[i].X0, origins[i].Y0, origins[i].X1 +
      0.5 / zoom, origins[i].Y1);
00426                         }
00427                         else
00428                         {
00429                             origins[i] = new Rectangle(origins[i].X0 - 0.5 / zoom, origins[i].Y0,
      origins[i].X1, origins[i].Y1);
00430                         }
00431                     }
00432 
00433 
00434                     if (roundedOrigin.Height > targets[i].Height)
00435                     {
00436                         if (origins[i].Y0 > actualPageArea.Y0)
00437                         {
00438                             origins[i] = new Rectangle(origins[i].X0, origins[i].Y0 + 0.5 / zoom,
      origins[i].X1, origins[i].Y1);
00439                         }
00440                         else
00441                         {
00442                             origins[i] = new Rectangle(origins[i].X0, origins[i].Y0, origins[i].X1,
      origins[i].Y1 - 0.5 / zoom);
```

```
00443                       }
00444                   }
00445                   else if (roundedOrigin.Height < targets[i].Height)
00446                   {
00447                       if (origins[i].X1 < actualPageArea.X1)
00448                       {
00449                           origins[i] = new Rectangle(origins[i].X0, origins[i].Y0, origins[i].X1,
      origins[i].Y1 + 0.5 / zoom);
00450                       }
00451                       else
00452                       {
00453                           origins[i] = new Rectangle(origins[i].X0, origins[i].Y0 - 0.5 / zoom,
      origins[i].X1, origins[i].Y1);
00454                       }
00455                   }
00456
00457                   roundedOrigin = origins[i].Round(zoom);
00458
00459                   if (roundedOrigin.Width == oldRoundedOrigin.Width && roundedOrigin.Height ==
      oldRoundedOrigin.Height && (roundedOrigin.Width != targets[i].Width || roundedOrigin.Height !=
      targets[i].Height))
00460                   {
00461                       countBlanks++;
00462                   }
00463
00464                   if (countBlanks >= 100)
00465                   {
00466                       //It seems that we can't coerce the expected size and the actual size to be
      the same. Give up.
00467                       return;
00468                   }
00469               }
00470           }
00471
00472           //Start each rendering thread.
00473           for (int i = 0; i < destinations.Length; i++)
00474           {
00475               double dzoom = zoom;
00476               Rectangle origin = origins[i];
00477               if (this.ImageXRes != 72 || this.ImageYRes != 72)
00478               {
00479                   dzoom *= Math.Sqrt(this.ImageXRes * this.ImageYRes) / 72;
00480                   origin = new Rectangle(origin.X0 * 72 / this.ImageXRes, origin.Y0 * 72 /
      this.ImageYRes, origin.X1 * 72 / this.ImageXRes, origin.Y1 * 72 / this.ImageYRes);
00481               }
00482
00483               RenderingThreads[i].Render(Contexts[i].NativeContext, DisplayList, origin,
      (float)dzoom, destinations[i], pixelFormat, this.PageBounds, ClipToPageBounds);
00484           }
00485
00486           //Wait until all the rendering threads have finished.
00487           for (int i = 0; i < destinations.Length; i++)
00488           {
00489               RenderingThreads[i].WaitForRendering();
00490           }
00491       }
00492
00493       /// <summary>
00494       /// Gets an element from a collection of <see cref="System.Span{T}">Span</see>&lt;<see
      cref="byte"/>&gt;
00495       /// </summary>
00496       /// <param name="index">The index of the element to get.</param>
00497       /// <returns>An element from a collection of <see cref="System.Span{T}">Span</see>&lt;<see
      cref="byte"/>&gt;</returns>
00498       public delegate Span<byte> GetSpanItem(int index);
00499
00500       /// <summary>
00501       /// Render the specified region to an image of the specified size, split in a number of tiles
      equal to the number of threads used by this <see cref="MuPDFMultiThreadedPageRenderer"/>, without
      marshaling. This method will not return until all the rendering threads have finished.
00502       /// Since creating an array of <see cref="Span{T}"/> is not allowed, this method returns a
      delegate that accepts an integer parameter (representing the index of the span in the "array") and
      returns the <see cref="Span{T}"/> corresponding to that index.
00503       /// </summary>
00504       /// <param name="targetSize">The total size of the image that should be rendered.</param>
00505       /// <param name="region">The region in page units that should be rendered.</param>
00506       /// <param name="disposables">A collection of <see cref="IDisposable"/>s that can be used to
      free the memory where the rendered tiles are stored. You should keep track of these and dispose them
      when you have finished working with the images.</param>
00507       /// <param name="pixelFormat">The format of the pixel data.</param>
00508       /// <returns>A delegate that accepts an integer parameter (representing the index of the span
      in the "array") and returns the <see cref="Span{T}"/> corresponding to that index.</returns>
00509       public GetSpanItem Render(RoundedSize targetSize, Rectangle region, out IDisposable[]
      disposables, PixelFormats pixelFormat)
00510       {
00511           RoundedRectangle[] targets = targetSize.Split(this.ThreadCount);
00512
```

```
00513             IntPtr[] destinations = new IntPtr[targets.Length];
00514             disposables = new IDisposable[targets.Length];
00515 
00516             bool hasAlpha = pixelFormat == PixelFormats.RGBA || pixelFormat == PixelFormats.BGRA;
00517 
00518             int[] sizes = new int[destinations.Length];
00519 
00520             for (int i = 0; i < targets.Length; i++)
00521             {
00522                 int allocSize = targets[i].Width * targets[i].Height * (hasAlpha ? 4 : 3);
00523 
00524                 sizes[i] = allocSize;
00525                 destinations[i] = Marshal.AllocHGlobal(allocSize);
00526                 disposables[i] = new DisposableIntPtr(destinations[i], allocSize);
00527             }
00528 
00529             this.Render(targetSize, region, destinations, pixelFormat);
00530 
00531             return i =>
00532             {
00533                 unsafe
00534                 {
00535                     return new Span<byte>((void*)destinations[i], sizes[i]);
00536                 }
00537             };
00538         }
00539 
00540         /// <summary>
00541         /// Signal to the rendering threads that they should abort rendering as soon as possible.
00542         /// </summary>
00543         public void Abort()
00544         {
00545             for (int i = 0; i < RenderingThreads.Length; i++)
00546             {
00547                 RenderingThreads[i].AbortRendering();
00548             }
00549         }
00550 
00551         /// <summary>
00552         /// Get the current rendering progress of all the threads.
00553         /// </summary>
00554         /// <returns>A <see cref="RenderProgress"/> object containing the rendering progress of all
      the threads.</returns>
00555         public RenderProgress GetProgress()
00556         {
00557             return new RenderProgress((from el in RenderingThreads select
      el.GetProgress()).ToArray());
00558         }
00559 
00560         private bool disposedValue;
00561 
00562         ///<inheritdoc/>
00563         protected virtual void Dispose(bool disposing)
00564         {
00565             if (!disposedValue)
00566             {
00567                 if (disposing)
00568                 {
00569                     Abort();
00570 
00571                     if (RenderingThreads != null)
00572                     {
00573                         for (int i = 0; i < RenderingThreads.Length; i++)
00574                         {
00575                             RenderingThreads[i].Dispose();
00576                         }
00577                     }
00578 
00579                     if (Contexts != null)
00580                     {
00581                         for (int i = 0; i < Contexts.Length; i++)
00582                         {
00583                             Contexts[i].Dispose();
00584                         }
00585                     }
00586                 }
00587                 disposedValue = true;
00588             }
00589         }
00590 
00591         ///<inheritdoc/>
00592         public void Dispose()
00593         {
00594             Dispose(disposing: true);
00595             GC.SuppressFinalize(this);
00596         }
00597     }
```

```
00598 }
```

8.9 MuPDFPage.cs

```
00001 /*
00002     MuPDFCore - A set of multiplatform .NET Core bindings for MuPDF.
00003     Copyright (C) 2020  Giorgio Bianchini
00004
00005     This program is free software: you can redistribute it and/or modify
00006     it under the terms of the GNU Affero General Public License as
00007     published by the Free Software Foundation, version 3.
00008
00009     This program is distributed in the hope that it will be useful,
00010     but WITHOUT ANY WARRANTY; without even the implied warranty of
00011     MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.  See the
00012     GNU Affero General Public License for more details.
00013
00014     You should have received a copy of the GNU Affero General Public License
00015     along with this program.  If not, see <http://www.gnu.org/licenses/>
00016 */
00017
00018 using System;
00019 using System.Collections;
00020 using System.Collections.Generic;
00021
00022 namespace MuPDFCore
00023 {
00024     /// <summary>
00025     /// A wrapper over a MuPDF page object, which contains information about the page's boundaries.
00026     /// </summary>
00027     public class MuPDFPage : IDisposable
00028     {
00029         /// <summary>
00030         /// The page's bounds at 72 DPI. Read-only.
00031         /// </summary>
00032         public Rectangle Bounds { get; }
00033
00034         /// <summary>
00035         /// The number of this page in the original document.
00036         /// </summary>
00037         public int PageNumber { get; }
00038
00039         /// <summary>
00040         /// A pointer to the native page object.
00041         /// </summary>
00042         internal readonly IntPtr NativePage;
00043
00044         /// <summary>
00045         /// The context that owns the document from which this page was extracted.
00046         /// </summary>
00047         private readonly MuPDFContext OwnerContext;
00048
00049         /// <summary>
00050         /// The document from which the page was extracted.
00051         /// </summary>
00052         internal readonly MuPDFDocument OwnerDocument;
00053
00054         /// <summary>
00055         /// The page's original bounds. Read-only.
00056         /// </summary>
00057         internal Rectangle OriginalBounds { get; }
00058
00059         /// <summary>
00060         /// Create a new <see cref="MuPDFPage"/> object from the specified document.
00061         /// </summary>
00062         /// <param name="context">The context that owns the document.</param>
00063         /// <param name="document">The document from which the page should be extracted.</param>
00064         /// <param name="number">The number of the page that should be extracted (starting at
       0).</param>
00065         internal MuPDFPage(MuPDFContext context, MuPDFDocument document, int number)
00066         {
00067             if (document.EncryptionState == EncryptionState.Encrypted)
00068             {
00069                 throw new DocumentLockedException("A password is necessary to render the document!");
00070             }
00071
00072             this.OwnerContext = context;
00073             this.OwnerDocument = document;
00074             this.PageNumber = number;
00075
00076             float x = 0;
00077             float y = 0;
00078             float w = 0;
```

```
00079             float h = 0;
00080
00081             ExitCodes result = (ExitCodes)NativeMethods.LoadPage(context.NativeContext,
      document.NativeDocument, number, ref NativePage, ref x, ref y, ref w, ref h);
00082
00083             this.Bounds = new Rectangle(Math.Round(x * document.ImageXRes / 72.0 * 1000) / 1000,
      Math.Round(y * document.ImageYRes / 72.0 * 1000) / 1000, Math.Round(w * document.ImageXRes / 72.0 *
      1000) / 1000, Math.Round(h * document.ImageYRes / 72.0 * 1000) / 1000);
00084             this.OriginalBounds = new Rectangle(x, y, w, h);
00085
00086             switch (result)
00087             {
00088                 case ExitCodes.EXIT_SUCCESS:
00089                     break;
00090                 case ExitCodes.ERR_CANNOT_LOAD_PAGE:
00091                     throw new MuPDFException("Cannot load page", result);
00092                 case ExitCodes.ERR_CANNOT_COMPUTE_BOUNDS:
00093                     throw new MuPDFException("Cannot compute bounds", result);
00094                 default:
00095                     throw new MuPDFException("Unknown error", result);
00096             }
00097         }
00098
00099         private bool disposedValue;
00100
00101         ///<inheritdoc/>
00102         protected virtual void Dispose(bool disposing)
00103         {
00104             if (!disposedValue)
00105             {
00106                 NativeMethods.DisposePage(OwnerContext.NativeContext, NativePage);
00107                 disposedValue = true;
00108             }
00109         }
00110
00111         ///<inheritdoc/>
00112         ~MuPDFPage()
00113         {
00114             if (NativePage != IntPtr.Zero)
00115             {
00116                 Dispose(disposing: false);
00117             }
00118         }
00119
00120         ///<inheritdoc/>
00121         public void Dispose()
00122         {
00123             Dispose(disposing: true);
00124             GC.SuppressFinalize(this);
00125         }
00126     }
00127
00128     /// <summary>
00129     /// A lazy collection of <see cref="MuPDFPage"/>s. Each page is loaded from the document as it is
      requested for the first time.
00130     /// </summary>
00131     public class MuPDFPageCollection : IReadOnlyList<MuPDFPage>, IDisposable
00132     {
00133         /// <summary>
00134         /// The internal store of the pages.
00135         /// </summary>
00136         private readonly MuPDFPage[] Pages;
00137
00138         /// <summary>
00139         /// The context that owns the document from which the pages were extracted.
00140         /// </summary>
00141         private readonly MuPDFContext OwnerContext;
00142
00143         /// <summary>
00144         /// The document from which the pages were extracted.
00145         /// </summary>
00146         private readonly MuPDFDocument OwnerDocument;
00147
00148         /// <summary>
00149         /// The number of pages in the collection.
00150         /// </summary>
00151         public int Length { get { return Pages.Length; } }
00152
00153         /// <summary>
00154         /// The number of pages in the collection.
00155         /// </summary>
00156         public int Count { get { return Pages.Length; } }
00157
00158         /// <summary>
00159         /// Get a page from the collection.
00160         /// </summary>
00161         /// <param name="index">The number of the page (starting at 0).</param>
```

```
00162         /// <returns>The specified <see cref="MuPDFPage"/>.</returns>
00163         public MuPDFPage this[int index]
00164         {
00165             get
00166             {
00167                 if (index < 0 || index > Pages.Length)
00168                 {
00169                     throw new IndexOutOfRangeException();
00170                 }
00171 
00172                 if (Pages[index] == null)
00173                 {
00174                     Pages[index] = new MuPDFPage(OwnerContext, OwnerDocument, index);
00175                 }
00176 
00177                 return Pages[index];
00178             }
00179         }
00180 
00181         /// <summary>
00182         /// Create a new <see cref="MuPDFPageCollection"/> from the specified document, containing the
    specified number of pages.
00183         /// </summary>
00184         /// <param name="context">The context that owns the document.</param>
00185         /// <param name="document">The document from which the pages should be extracted.</param>
00186         /// <param name="length">The number of pages in the document.</param>
00187         internal MuPDFPageCollection(MuPDFContext context, MuPDFDocument document, int length)
00188         {
00189             Pages = new MuPDFPage[length];
00190             OwnerContext = context;
00191             OwnerDocument = document;
00192         }
00193 
00194         ///<inheritdoc/>
00195         public IEnumerator<MuPDFPage> GetEnumerator()
00196         {
00197             for (int i = 0; i < Pages.Length; i++)
00198             {
00199                 if (Pages[i] == null)
00200                 {
00201                     Pages[i] = new MuPDFPage(OwnerContext, OwnerDocument, i);
00202                 }
00203             }
00204 
00205             return ((IEnumerable<MuPDFPage>)Pages).GetEnumerator();
00206         }
00207 
00208         ///<inheritdoc/>
00209         IEnumerator IEnumerable.GetEnumerator()
00210         {
00211             return GetEnumerator();
00212         }
00213 
00214         private bool disposedValue;
00215 
00216         ///<inheritdoc/>
00217         protected virtual void Dispose(bool disposing)
00218         {
00219             if (!disposedValue)
00220             {
00221                 if (disposing)
00222                 {
00223                     for (int i = 0; i < Pages.Length; i++)
00224                     {
00225                         Pages[i]?.Dispose();
00226                     }
00227                 }
00228 
00229                 disposedValue = true;
00230             }
00231         }
00232 
00233         ///<inheritdoc/>
00234         public void Dispose()
00235         {
00236             Dispose(disposing: true);
00237             GC.SuppressFinalize(this);
00238         }
00239     }
00240 }
```

8.10 MuPDFStructuredTextPage.cs

```
00001 using System;
```

```
00002 using System.Collections;
00003 using System.Collections.Generic;
00004 using System.Runtime.InteropServices;
00005 using System.Text;
00006 using System.Text.RegularExpressions;
00007 using System.Threading;
00008 using System.Threading.Tasks;
00009
00010 namespace MuPDFCore
00011 {
00012     /// <summary>
00013     /// Describes OCR progress.
00014     /// </summary>
00015     public class OCRProgressInfo
00016     {
00017         /// <summary>
00018         /// A value between 0 and 1, indicating how much progress has been completed.
00019         /// </summary>
00020         public double Progress { get; }
00021
00022         internal OCRProgressInfo(double progress)
00023         {
00024             this.Progress = progress;
00025         }
00026     }
00027
00028     /// <summary>
00029     /// Represents a structured representation of the text contained in a page.
00030     /// </summary>
00031     public class MuPDFStructuredTextPage : IReadOnlyList<MuPDFStructuredTextBlock>
00032     {
00033         /// <summary>
00034         /// The blocks contained in the page.
00035         /// </summary>
00036         public MuPDFStructuredTextBlock[] StructuredTextBlocks { get; private set; }
00037
00038         /// <summary>
00039         /// The number of blocks in the page.
00040         /// </summary>
00041         public int Count =>
      ((IReadOnlyCollection<MuPDFStructuredTextBlock>)StructuredTextBlocks).Count;
00042
00043         /// <summary>
00044         /// Gets the specified block in the page.
00045         /// </summary>
00046         /// <param name="index">The index of the block.</param>
00047         /// <returns>The block with the specified <paramref name="index"/>.</returns>
00048         public MuPDFStructuredTextBlock this[int index] =>
      ((IReadOnlyList<MuPDFStructuredTextBlock>)StructuredTextBlocks)[index];
00049
00050         /// <summary>
00051         /// Gets the specified character in the page.
00052         /// </summary>
00053         /// <param name="address">The address (block, line and character index) of the
      character.</param>
00054         /// <returns>A <see cref="MuPDFStructuredTextCharacter"/> representing the specified
      character.</returns>
00055         public MuPDFStructuredTextCharacter this[MuPDFStructuredTextAddress address]
00056         {
00057             get
00058             {
00059                 return
      StructuredTextBlocks[address.BlockIndex][address.LineIndex][address.CharacterIndex];
00060             }
00061         }
00062
00063         internal MuPDFStructuredTextPage(MuPDFContext context, MuPDFDisplayList list,
      TesseractLanguage ocrLanguage, double zoom, Rectangle pageBounds, CancellationToken cancellationToken
      = default, IProgress<OCRProgressInfo> progress = null)
00064         {
00065             if (ocrLanguage != null && RuntimeInformation.IsOSPlatform(OSPlatform.Windows) &&
      RuntimeInformation.ProcessArchitecture == Architecture.X86 && (cancellationToken != default ||
      progress != null))
00066             {
00067                 throw new PlatformNotSupportedException("A cancellationToken or a progress callback
      are not supported on Windows x86!");
00068             }
00069
00070             int blockCount = -1;
00071
00072             IntPtr nativeStructuredPage = IntPtr.Zero;
00073
00074             ExitCodes result;
00075
00076             if (ocrLanguage != null)
00077             {
00078                 result = (ExitCodes)NativeMethods.GetStructuredTextPageWithOCR(context.NativeContext,
```

```
        list.NativeDisplayList, ref nativeStructuredPage, ref blockCount, (float)zoom, pageBounds.X0,
        pageBounds.Y0, pageBounds.X1, pageBounds.Y1, "TESSDATA_PREFIX=" + ocrLanguage.Prefix,
        ocrLanguage.Language, prog =>
00079                   {
00080                       progress?.Report(new OCRProgressInfo(prog / 100.0));
00081
00082                       if (cancellationToken.IsCancellationRequested)
00083                       {
00084                           return 1;
00085                       }
00086                       else
00087                       {
00088                           return 0;
00089                       }
00090                   });
00091               }
00092               else
00093               {
00094                   result = (ExitCodes)NativeMethods.GetStructuredTextPage(context.NativeContext,
        list.NativeDisplayList, ref nativeStructuredPage, ref blockCount);
00095               }
00096
00097               cancellationToken.ThrowIfCancellationRequested();
00098
00099               switch (result)
00100               {
00101                   case ExitCodes.EXIT_SUCCESS:
00102                       break;
00103                   case ExitCodes.ERR_CANNOT_CREATE_PAGE:
00104                       throw new MuPDFException("Cannot create page", result);
00105                   case ExitCodes.ERR_CANNOT_POPULATE_PAGE:
00106                       throw new MuPDFException("Cannot populate page", result);
00107                   default:
00108                       throw new MuPDFException("Unknown error", result);
00109               }
00110
00111               IntPtr[] blockPointers = new IntPtr[blockCount];
00112               GCHandle blocksHandle = GCHandle.Alloc(blockPointers, GCHandleType.Pinned);
00113
00114               try
00115               {
00116                   result = (ExitCodes)NativeMethods.GetStructuredTextBlocks(nativeStructuredPage,
        blocksHandle.AddrOfPinnedObject());
00117
00118                   switch (result)
00119                   {
00120                       case ExitCodes.EXIT_SUCCESS:
00121                           break;
00122                       default:
00123                           throw new MuPDFException("Unknown error", result);
00124                   }
00125
00126                   StructuredTextBlocks = new MuPDFStructuredTextBlock[blockCount];
00127
00128                   for (int i = 0; i < blockCount; i++)
00129                   {
00130                       int type = -1;
00131                       float x0 = -1;
00132                       float y0 = -1;
00133                       float x1 = -1;
00134                       float y1 = -1;
00135                       int lineCount = -1;
00136
00137                       result = (ExitCodes)NativeMethods.GetStructuredTextBlock(blockPointers[i], ref
        type, ref x0, ref y0, ref x1, ref y1, ref lineCount);
00138
00139                       switch (result)
00140                       {
00141                           case ExitCodes.EXIT_SUCCESS:
00142                               break;
00143                           default:
00144                               throw new MuPDFException("Unknown error", result);
00145                       }
00146
00147                       Rectangle bBox = new Rectangle(x0, y0, x1, y1);
00148
00149                       switch ((MuPDFStructuredTextBlock.Types)type)
00150                       {
00151                           case MuPDFStructuredTextBlock.Types.Image:
00152                               this.StructuredTextBlocks[i] = new MuPDFImageStructuredTextBlock(bBox);
00153                               break;
00154                           case MuPDFStructuredTextBlock.Types.Text:
00155                               this.StructuredTextBlocks[i] = new MuPDFTextStructuredTextBlock(bBox,
        blockPointers[i], lineCount);
00156                               break;
00157                       }
00158                   }
```

```
00159             }
00160             finally
00161             {
00162                 blocksHandle.Free();
00163             }
00164
00165             NativeMethods.DisposeStructuredTextPage(context.NativeContext, nativeStructuredPage);
00166         }
00167
00168         /// <summary>
00169         /// Gets the address of the character that contains the specified <paramref name="point"/> in page units.
00170         /// </summary>
00171         /// <param name="point">The point that must be contained by the character. This is expressed in page units (i.e. with a zoom factor of 1).</param>
00172         /// <param name="includeImages">If this is <see langword="true"/>, blocks containing images may be returned. Otherwise, only blocks containing text are considered.</param>
00173         /// <returns>The address of the character containing the specified <paramref name="point"/>, or <see langword="null"/> if no character contains the <paramref name="point"/>.</returns>
00174         public MuPDFStructuredTextAddress? GetHitAddress(PointF point, bool includeImages)
00175         {
00176             for (int i = 0; i < this.Count; i++)
00177             {
00178                 if (includeImages || this[i].Type == MuPDFStructuredTextBlock.Types.Text)
00179                 {
00180                     if (this[i].BoundingBox.Contains(point))
00181                     {
00182                         for (int j = 0; j < this[i].Count; j++)
00183                         {
00184                             if (this[i][j].BoundingBox.Contains(point))
00185                             {
00186                                 for (int k = 0; k < this[i][j].Count; k++)
00187                                 {
00188                                     if (this[i][j][k].BoundingQuad.Contains(point))
00189                                     {
00190                                         return new MuPDFStructuredTextAddress(i, j, k);
00191                                     }
00192                                 }
00193                             }
00194                         }
00195                     }
00196                 }
00197             }
00198
00199             return null;
00200         }
00201
00202         /// <summary>
00203         /// Gets the address of the character that contains the specified <paramref name="point"/> in page units.
00204         /// </summary>
00205         /// <param name="point">The point that must be closest to the character. This is expressed in page units (i.e. with a zoom factor of 1).</param>
00206         /// <param name="includeImages">If this is <see langword="true"/>, blocks containing images may be returned. Otherwise, only blocks containing text are considered.</param>
00207         /// <returns>The address of the character closest to the specified <paramref name="point"/> This is <see langword="null"/> only if the page contains no characters.</returns>
00208         public MuPDFStructuredTextAddress? GetClosestHitAddress(PointF point, bool includeImages)
00209         {
00210             float minDistance = float.MaxValue;
00211             MuPDFStructuredTextAddress? closestHit = null;
00212
00213             float minBlockDistance = float.MaxValue;
00214             float minLineDistance = float.MaxValue;
00215
00216             for (int i = 0; i < this.Count; i++)
00217             {
00218                 if (includeImages || this[i].Type == MuPDFStructuredTextBlock.Types.Text)
00219                 {
00220                     float dx = Math.Max(0, Math.Max(this[i].BoundingBox.X0 - point.X, point.X - this[i].BoundingBox.X1));
00221                     float dy = Math.Max(0, Math.Max(this[i].BoundingBox.Y0 - point.Y, point.Y - this[i].BoundingBox.Y1));
00222                     float blockDist = dx * dx + dy * dy;
00223
00224                     if (this[i].BoundingBox.Contains(point) || blockDist < minBlockDistance)
00225                     {
00226                         if (blockDist < minBlockDistance)
00227                         {
00228                             minBlockDistance = blockDist;
00229                             minLineDistance = float.MaxValue;
00230                         }
00231
00232                         for (int j = 0; j < this[i].Count; j++)
00233                         {
00234                             dx = Math.Max(0, Math.Max(this[i][j].BoundingBox.X0 - point.X, point.X - this[i][j].BoundingBox.X1));
```

```
00235                           dy = Math.Max(0, Math.Max(this[i][j].BoundingBox.Y0 - point.Y, point.Y -
     this[i][j].BoundingBox.Y1));
00236                           float lineDist = dx * dx + dy * dy;
00237
00238                           if (this[i][j].BoundingBox.Contains(point) || lineDist < minLineDistance)
00239                           {
00240                               if (lineDist < minLineDistance)
00241                               {
00242                                   minLineDistance = lineDist;
00243                               }
00244
00245                               for (int k = 0; k < this[i][j].Count; k++)
00246                               {
00247                                   if (this[i][j][k].BoundingQuad.Contains(point))
00248                                   {
00249                                       return new MuPDFStructuredTextAddress(i, j, k);
00250                                   }
00251                                   else
00252                                   {
00253                                       //The quads should be small enough that the error due to only
     checking vertices and not sides is negligible. Also, since the square root is monotonous, we can skip
     it.
00254                                       float minDist = (point.X -
     this[i][j][k].BoundingQuad.UpperLeft.X) * (point.X - this[i][j][k].BoundingQuad.UpperLeft.X) +
     (point.Y - this[i][j][k].BoundingQuad.UpperLeft.Y) * (point.Y -
     this[i][j][k].BoundingQuad.UpperLeft.Y);
00255                                       minDist = Math.Min(minDist, (point.X -
     this[i][j][k].BoundingQuad.UpperRight.X) * (point.X - this[i][j][k].BoundingQuad.UpperRight.X) +
     (point.Y - this[i][j][k].BoundingQuad.UpperRight.Y) * (point.Y -
     this[i][j][k].BoundingQuad.UpperRight.Y));
00256                                       minDist = Math.Min(minDist, (point.X -
     this[i][j][k].BoundingQuad.LowerRight.X) * (point.X - this[i][j][k].BoundingQuad.LowerRight.X) +
     (point.Y - this[i][j][k].BoundingQuad.LowerRight.Y) * (point.Y -
     this[i][j][k].BoundingQuad.LowerRight.Y));
00257                                       minDist = Math.Min(minDist, (point.X -
     this[i][j][k].BoundingQuad.LowerLeft.X) * (point.X - this[i][j][k].BoundingQuad.LowerLeft.X) +
     (point.Y - this[i][j][k].BoundingQuad.LowerLeft.Y) * (point.Y -
     this[i][j][k].BoundingQuad.LowerLeft.Y));
00258
00259                                       if (minDist < minDistance)
00260                                       {
00261                                           minDistance = minDist;
00262                                           closestHit = new MuPDFStructuredTextAddress(i, j, k);
00263                                       }
00264                                   }
00265                               }
00266                           }
00267                       }
00268                   }
00269               }
00270           }
00271
00272           return closestHit;
00273       }
00274
00275       /// <summary>
00276       /// Gets a collection of <see cref="Quad"/>s delimiting the specified character <paramref
     name="range"/>. Where possible, these are collapsed at the line and block level. Each <see
     cref="Quad"/> may or may not be a rectangle.
00277       /// </summary>
00278       /// <param name="range">A <see cref="MuPDFStructuredTextAddressSpan"/> representing the
     character range</param>
00279       /// <param name="includeImages">If this is <see langword="true"/>, the bounding boxes for
     blocks containing images are also returned. Otherwise, only blocks containing text are
     considered.</param>
00280       /// <returns>A lazy collection of <see cref="Quad"/>s delimiting the characters in the
     specified <paramref name="includeImages"/>.</returns>
00281       public IEnumerable<Quad> GetHighlightQuads(MuPDFStructuredTextAddressSpan range, bool
     includeImages)
00282       {
00283           if (range == null || range.End == null)
00284           {
00285               yield break;
00286           }
00287
00288           MuPDFStructuredTextAddress rangeStart = range.Start;
00289           MuPDFStructuredTextAddress rangeEnd = range.End.Value;
00290
00291           if (rangeEnd < rangeStart)
00292           {
00293               MuPDFStructuredTextAddress temp = rangeStart;
00294               rangeStart = rangeEnd;
00295               rangeEnd = temp;
00296           }
00297
00298           if (rangeStart.BlockIndex != rangeEnd.BlockIndex)
00299           {
```

```
00300                 //Add remaining part of this block
00301                 if (rangeStart.LineIndex == 0 && rangeStart.CharacterIndex == 0)
00302                 {
00303                     if (includeImages || this[rangeStart.BlockIndex].Type ==
    MuPDFStructuredTextBlock.Types.Text)
00304                     {
00305                         yield return this[rangeStart.BlockIndex].BoundingBox.ToQuad();
00306                     }
00307                 }
00308                 else
00309                 {
00310                     if (rangeStart.CharacterIndex == 0)
00311                     {
00312                         yield return
    this[rangeStart.BlockIndex][rangeStart.LineIndex].BoundingBox.ToQuad();
00313                     }
00314                     else
00315                     {
00316                         for (int i = rangeStart.CharacterIndex; i <
    this[rangeStart.BlockIndex][rangeStart.LineIndex].Count; i++)
00317                         {
00318                             yield return
    this[rangeStart.BlockIndex][rangeStart.LineIndex][i].BoundingQuad;
00319                         }
00320                     }
00321
00322                     for (int j = rangeStart.LineIndex + 1; j < this[rangeStart.BlockIndex].Count; j++)
00323                     {
00324                         yield return this[rangeStart.BlockIndex][j].BoundingBox.ToQuad();
00325                     }
00326                 }
00327
00328                 //Add full blocks in the middle
00329                 for (int i = rangeStart.BlockIndex + 1; i < rangeEnd.BlockIndex; i++)
00330                 {
00331                     if (includeImages || this[i].Type == MuPDFStructuredTextBlock.Types.Text)
00332                     {
00333                         yield return this[i].BoundingBox.ToQuad();
00334                     }
00335                 }
00336
00337                 rangeStart = new MuPDFStructuredTextAddress(rangeEnd.BlockIndex, 0, 0);
00338             }
00339
00340             if (includeImages || this[rangeStart.BlockIndex].Type ==
    MuPDFStructuredTextBlock.Types.Text)
00341             {
00342                 if (rangeStart.LineIndex != rangeEnd.LineIndex)
00343                 {
00344                     //Add remaining part of this line
00345                     if (rangeStart.CharacterIndex == 0)
00346                     {
00347                         yield return
    this[rangeStart.BlockIndex][rangeStart.LineIndex].BoundingBox.ToQuad();
00348                     }
00349                     else
00350                     {
00351                         for (int i = rangeStart.CharacterIndex; i <
    this[rangeStart.BlockIndex][rangeStart.LineIndex].Count; i++)
00352                         {
00353                             yield return
    this[rangeStart.BlockIndex][rangeStart.LineIndex][i].BoundingQuad;
00354                         }
00355                     }
00356
00357                     //Add full lines in the middle
00358                     for (int j = rangeStart.LineIndex + 1; j < rangeEnd.LineIndex; j++)
00359                     {
00360                         yield return this[rangeStart.BlockIndex][j].BoundingBox.ToQuad();
00361                     }
00362
00363                     rangeStart = new MuPDFStructuredTextAddress(rangeEnd.BlockIndex,
    rangeEnd.LineIndex, 0);
00364                 }
00365
00366                 //Add remaining part of this line
00367                 if (rangeStart.CharacterIndex == 0 && rangeEnd.CharacterIndex ==
    this[rangeStart.BlockIndex][rangeStart.LineIndex].Count - 1)
00368                 {
00369                     yield return
    this[rangeStart.BlockIndex][rangeStart.LineIndex].BoundingBox.ToQuad();
00370                 }
00371                 else
00372                 {
00373                     for (int j = rangeStart.CharacterIndex; j <= rangeEnd.CharacterIndex; j++)
00374                     {
00375                         yield return
```

```
this[rangeStart.BlockIndex][rangeStart.LineIndex][j].BoundingQuad;
00376                   }
00377               }
00378           }
00379       }
00380
00381       /// <summary>
00382       /// Gets the text corresponding to the specified character <paramref name="range"/>. Blocks
containing images are ignored.
00383       /// </summary>
00384       /// <param name="range">A <see cref="MuPDFStructuredTextAddressSpan"/> representing the range
of text to extract.</param>
00385       /// <returns>A string representation of the text contained in the specified <paramref
name="range"/>.</returns>
00386       public string GetText(MuPDFStructuredTextAddressSpan range)
00387       {
00388           if (range == null || range.End == null)
00389           {
00390               return null;
00391           }
00392
00393           MuPDFStructuredTextAddress selectionStart = range.Start;
00394           MuPDFStructuredTextAddress selectionEnd = range.End.Value;
00395
00396           if (selectionEnd < selectionStart)
00397           {
00398               MuPDFStructuredTextAddress temp = selectionStart;
00399               selectionStart = selectionEnd;
00400               selectionEnd = temp;
00401           }
00402
00403           StringBuilder builder = new StringBuilder();
00404
00405           if (selectionStart.BlockIndex != selectionEnd.BlockIndex)
00406           {
00407               //Add remaining part of this block
00408               if (selectionStart.LineIndex == 0 && selectionStart.CharacterIndex == 0)
00409               {
00410                   if (this[selectionStart.BlockIndex].Type == MuPDFStructuredTextBlock.Types.Text)
00411                   {
00412
builder.Append(((MuPDFTextStructuredTextBlock)this[selectionStart.BlockIndex]).ToString());
00413                   }
00414               }
00415               else
00416               {
00417                   if (selectionStart.CharacterIndex == 0)
00418                   {
00419
builder.AppendLine(this[selectionStart.BlockIndex][selectionStart.LineIndex].ToString());
00420                   }
00421                   else
00422                   {
00423                       for (int i = selectionStart.CharacterIndex; i <
this[selectionStart.BlockIndex][selectionStart.LineIndex].Count; i++)
00424                       {
00425
builder.Append(this[selectionStart.BlockIndex][selectionStart.LineIndex][i].ToString());
00426                       }
00427                       builder.AppendLine();
00428                   }
00429
00430                   for (int j = selectionStart.LineIndex + 1; j <
this[selectionStart.BlockIndex].Count; j++)
00431                   {
00432                       builder.AppendLine(this[selectionStart.BlockIndex][j].ToString());
00433                   }
00434               }
00435
00436               //Add full blocks in the middle
00437               for (int i = selectionStart.BlockIndex + 1; i < selectionEnd.BlockIndex; i++)
00438               {
00439                   if (this[i].Type == MuPDFStructuredTextBlock.Types.Text)
00440                   {
00441                       builder.Append(this[i].ToString());
00442                   }
00443               }
00444
00445               selectionStart = new MuPDFStructuredTextAddress(selectionEnd.BlockIndex, 0, 0);
00446           }
00447
00448           if (this[selectionStart.BlockIndex].Type == MuPDFStructuredTextBlock.Types.Text)
00449           {
00450               if (selectionStart.LineIndex != selectionEnd.LineIndex)
00451               {
00452                   //Add remaining part of this line
00453                   if (selectionStart.CharacterIndex == 0)
```

```
00454                     {
00455
      builder.AppendLine(this[selectionStart.BlockIndex][selectionStart.LineIndex].ToString());
00456                     }
00457                     else
00458                     {
00459                         for (int i = selectionStart.CharacterIndex; i <
      this[selectionStart.BlockIndex][selectionStart.LineIndex].Count; i++)
00460                         {
00461
      builder.Append(this[selectionStart.BlockIndex][selectionStart.LineIndex][i].ToString());
00462                         }
00463                         builder.AppendLine();
00464                     }
00465
00466                     //Add full lines in the middle
00467                     for (int j = selectionStart.LineIndex + 1; j < selectionEnd.LineIndex; j++)
00468                     {
00469                         builder.AppendLine(this[selectionStart.BlockIndex][j].ToString());
00470                     }
00471
00472                     selectionStart = new MuPDFStructuredTextAddress(selectionEnd.BlockIndex,
      selectionEnd.LineIndex, 0);
00473                 }
00474
00475                 //Add remaining part of this line
00476                 if (selectionStart.CharacterIndex == 0 && selectionEnd.CharacterIndex ==
      this[selectionStart.BlockIndex][selectionStart.LineIndex].Count - 1)
00477                 {
00478
      builder.Append(this[selectionStart.BlockIndex][selectionStart.LineIndex].ToString());
00479                 }
00480                 else
00481                 {
00482                     for (int j = selectionStart.CharacterIndex; j <= selectionEnd.CharacterIndex; j++)
00483                     {
00484
      builder.Append(this[selectionStart.BlockIndex][selectionStart.LineIndex][j].ToString());
00485                     }
00486                 }
00487             }
00488
00489             return builder.ToString();
00490         }
00491
00492         /// <summary>
00493         /// Searches for the specified <see cref="Regex"/> in the text of the page. A single match
      cannot span multiple lines.
00494         /// </summary>
00495         /// <param name="needle">The <see cref="Regex"/> to search for.</param>
00496         /// <returns>A lazy collection of <see cref="MuPDFStructuredTextAddressSpan"/>s representing
      all the occurrences of the <paramref name="needle"/> in the text.</returns>
00497         public IEnumerable<MuPDFStructuredTextAddressSpan> Search(Regex needle)
00498         {
00499
00500             for (int i = 0; i < this.Count; i++)
00501             {
00502                 if (this[i].Type == MuPDFStructuredTextBlock.Types.Text)
00503                 {
00504                     for (int j = 0; j < this[i].Count; j++)
00505                     {
00506                         foreach (Match match in needle.Matches(this[i][j].Text))
00507                         {
00508                             if (match.Success)
00509                             {
00510                                 int startIndex = 0;
00511                                 int kStart = 0;
00512
00513                                 while (startIndex < match.Index)
00514                                 {
00515                                     startIndex += this[i][j][kStart].Character.Length;
00516                                     kStart++;
00517                                 }
00518
00519                                 if (startIndex > match.Index)
00520                                 {
00521                                     kStart--;
00522                                 }
00523
00524                                 int length = 0;
00525                                 int kEnd = kStart - 1;
00526
00527                                 while (length < match.Length)
00528                                 {
00529                                     kEnd++;
00530                                     length += this[i][j][kEnd].Character.Length;
00531                                 }
```

```
00532
00533                                   yield return new MuPDFStructuredTextAddressSpan(new
    MuPDFStructuredTextAddress(i, j, kStart), new MuPDFStructuredTextAddress(i, j, kEnd));
00534                               }
00535                           }
00536                       }
00537                   }
00538               }
00539           }
00540
00541           /// <inheritdoc/>
00542           public IEnumerator<MuPDFStructuredTextBlock> GetEnumerator()
00543           {
00544               return ((IEnumerable<MuPDFStructuredTextBlock>)StructuredTextBlocks).GetEnumerator();
00545           }
00546
00547           IEnumerator IEnumerable.GetEnumerator()
00548           {
00549               return StructuredTextBlocks.GetEnumerator();
00550           }
00551       }
00552
00553       /// <summary>
00554       /// Represents a structured text block containing text or an image.
00555       /// </summary>
00556       public abstract class MuPDFStructuredTextBlock : IReadOnlyList<MuPDFStructuredTextLine>
00557       {
00558           /// <summary>
00559           /// Defines the type of the block.
00560           /// </summary>
00561           public enum Types
00562           {
00563               /// <summary>
00564               /// The block contains text.
00565               /// </summary>
00566               Text = 0,
00567
00568               /// <summary>
00569               /// The block contains an image.
00570               /// </summary>
00571               Image = 1
00572           }
00573
00574           /// <summary>
00575           /// The type of the block.
00576           /// </summary>
00577           public abstract Types Type { get; }
00578
00579           /// <summary>
00580           /// The bounding box of the block.
00581           /// </summary>
00582           public Rectangle BoundingBox { get; }
00583
00584           /// <summary>
00585           /// The number of lines in the block.
00586           /// </summary>
00587           public abstract int Count { get; }
00588
00589           /// <summary>
00590           /// Gets the specified line from the block.
00591           /// </summary>
00592           /// <param name="index">The index of the line to extract.</param>
00593           /// <returns>The <see cref="MuPDFStructuredTextLine"/> with the specified <paramref
    name="index"/>.</returns>
00594           public abstract MuPDFStructuredTextLine this[int index] { get; }
00595
00596           internal MuPDFStructuredTextBlock() { }
00597
00598           internal MuPDFStructuredTextBlock(Rectangle boundingBox)
00599           {
00600               this.BoundingBox = boundingBox;
00601           }
00602
00603           /// <inheritdoc/>
00604           public abstract IEnumerator<MuPDFStructuredTextLine> GetEnumerator();
00605
00606           IEnumerator IEnumerable.GetEnumerator()
00607           {
00608               return this.GetEnumerator();
00609           }
00610       }
00611
00612       /// <summary>
00613       /// Represents a block containing a single image. The block contains a single line with a single
    character.
00614       /// </summary>
00615       public class MuPDFImageStructuredTextBlock : MuPDFStructuredTextBlock
```

```
00616     {
00617         /// <inheritdoc/>
00618         public override Types Type => Types.Image;
00619 
00620         /// <inheritdoc/>
00621         public override int Count => 1;
00622 
00623         private readonly MuPDFStructuredTextLine Line;
00624 
00625         /// <inheritdoc/>
00626         public override MuPDFStructuredTextLine this[int index]
00627         {
00628             get
00629             {
00630                 if (index == 0)
00631                 {
00632                     return Line;
00633                 }
00634                 else
00635                 {
00636                     throw new IndexOutOfRangeException("A structured text block containing an image
      only has one line!");
00637                 }
00638             }
00639         }
00640 
00641         internal MuPDFImageStructuredTextBlock(Rectangle boundingBox) : base(boundingBox)
00642         {
00643             this.Line = new MuPDFStructuredTextLine(this.BoundingBox);
00644         }
00645 
00646         /// <inheritdoc/>
00647         public override IEnumerator<MuPDFStructuredTextLine> GetEnumerator()
00648         {
00649             return ((IEnumerable<MuPDFStructuredTextLine>)new MuPDFStructuredTextLine[] { Line
      }).GetEnumerator();
00650         }
00651     }
00652 
00653     /// <summary>
00654     /// Represents a block containing multiple lines of text (typically a paragraph).
00655     /// </summary>
00656     public class MuPDFTextStructuredTextBlock : MuPDFStructuredTextBlock
00657     {
00658         /// <inheritdoc/>
00659         public override Types Type => Types.Text;
00660 
00661         /// <summary>
00662         /// The lines of text in the block.
00663         /// </summary>
00664         public MuPDFStructuredTextLine[] Lines { get; }
00665 
00666         /// <inheritdoc/>
00667         public override int Count => ((IReadOnlyCollection<MuPDFStructuredTextLine>)Lines).Count;
00668 
00669         /// <inheritdoc/>
00670         public override MuPDFStructuredTextLine this[int index] =>
      ((IReadOnlyList<MuPDFStructuredTextLine>)Lines)[index];
00671 
00672         internal MuPDFTextStructuredTextBlock(Rectangle boundingBox, IntPtr blockPointer, int
      lineCount) : base(boundingBox)
00673         {
00674             IntPtr[] linePointers = new IntPtr[lineCount];
00675             GCHandle linesHandle = GCHandle.Alloc(linePointers, GCHandleType.Pinned);
00676 
00677             try
00678             {
00679                 ExitCodes result = (ExitCodes)NativeMethods.GetStructuredTextLines(blockPointer,
      linesHandle.AddrOfPinnedObject());
00680 
00681                 switch (result)
00682                 {
00683                     case ExitCodes.EXIT_SUCCESS:
00684                         break;
00685                     default:
00686                         throw new MuPDFException("Unknown error", result);
00687                 }
00688 
00689                 Lines = new MuPDFStructuredTextLine[lineCount];
00690 
00691                 for (int i = 0; i < lineCount; i++)
00692                 {
00693                     int wmode = -1;
00694                     float x0 = -1;
00695                     float y0 = -1;
00696                     float x1 = -1;
00697                     float y1 = -1;
```

```
00698
00699                   float x = -1;
00700                   float y = -1;
00701
00702                   int charCount = -1;
00703
00704                   result = (ExitCodes)NativeMethods.GetStructuredTextLine(linePointers[i], ref
      wmode, ref x0, ref y0, ref x1, ref y1, ref x, ref y, ref charCount);
00705
00706                   switch (result)
00707                   {
00708                       case ExitCodes.EXIT_SUCCESS:
00709                           break;
00710                       default:
00711                           throw new MuPDFException("Unknown error", result);
00712                   }
00713
00714                   Rectangle bBox = new Rectangle(x0, y0, x1, y1);
00715                   PointF direction = new PointF(x, y);
00716
00717                   Lines[i] = new MuPDFStructuredTextLine(linePointers[i],
      (MuPDFStructuredTextLine.WritingModes)wmode, direction, bBox, charCount);
00718               }
00719           }
00720           finally
00721           {
00722               linesHandle.Free();
00723           }
00724       }
00725
00726       /// <inheritdoc/>
00727       public override IEnumerator<MuPDFStructuredTextLine> GetEnumerator()
00728       {
00729           return ((IEnumerable<MuPDFStructuredTextLine>)Lines).GetEnumerator();
00730       }
00731
00732       /// <summary>
00733       /// Returns the text contained in the block as a <see cref="string"/>.
00734       /// </summary>
00735       /// <returns>The text contained in the block as a <see cref="string"/>. If the block contains
      at least one line, the return value has a line terminator at the end.</returns>
00736       public override string ToString()
00737       {
00738           StringBuilder text = new StringBuilder();
00739
00740           foreach (MuPDFStructuredTextLine line in this)
00741           {
00742               text.AppendLine(line.Text);
00743           }
00744
00745           return text.ToString();
00746       }
00747   }
00748
00749   /// <summary>
00750   /// Represents a single line of text (i.e. characters that share a common baseline).
00751   /// </summary>
00752   public class MuPDFStructuredTextLine : IReadOnlyList<MuPDFStructuredTextCharacter>
00753   {
00754       /// <summary>
00755       /// Defines the writing mode of the text.
00756       /// </summary>
00757       public enum WritingModes
00758       {
00759           /// <summary>
00760           /// The text is written horizontally.
00761           /// </summary>
00762           Horizontal = 0,
00763
00764           /// <summary>
00765           /// The text is written vertically.
00766           /// </summary>
00767           Vertical = 1
00768       }
00769
00770       /// <summary>
00771       /// The writing mode of the text.
00772       /// </summary>
00773       public WritingModes WritingMode { get; }
00774
00775       /// <summary>
00776       /// The normalised direction of the text baseline.
00777       /// </summary>
00778       public PointF Direction { get; }
00779
00780       /// <summary>
00781       /// The bounding box of the line.
```

```
00782         /// </summary>
00783         public Rectangle BoundingBox { get; }
00784 
00785         /// <summary>
00786         /// The characters contained in the line.
00787         /// </summary>
00788         public MuPDFStructuredTextCharacter[] Characters { get; }
00789 
00790         /// <summary>
00791         /// A string representation of the characters contained in the line.
00792         /// </summary>
00793         public string Text { get; }
00794 
00795         /// <summary>
00796         /// The number of characters in the line.
00797         /// </summary>
00798         public int Count => ((IReadOnlyCollection<MuPDFStructuredTextCharacter>)Characters).Count;
00799 
00800         /// <summary>
00801         /// Gets the specified character from the line.
00802         /// </summary>
00803         /// <param name="index">The index of the character.</param>
00804         /// <returns>The <see cref="MuPDFStructuredTextCharacter"/> with the specified <paramref
      name="index"/>.</returns>
00805         public MuPDFStructuredTextCharacter this[int index] =>
      ((IReadOnlyList<MuPDFStructuredTextCharacter>)Characters)[index];
00806 
00807         internal MuPDFStructuredTextLine(Rectangle boundingBox)
00808         {
00809             this.BoundingBox = boundingBox;
00810             this.Characters = new MuPDFStructuredTextCharacter[]
00811             {
00812                 new MuPDFStructuredTextCharacter(0, -1, new PointF(boundingBox.X0, boundingBox.Y1),
      new Quad(new PointF(boundingBox.X0, boundingBox.Y1), new PointF(boundingBox.X0, boundingBox.Y0), new
      PointF(boundingBox.X1, boundingBox.Y0), new PointF(boundingBox.X1, boundingBox.Y1)), 9)
00813             };
00814         }
00815 
00816         internal MuPDFStructuredTextLine(IntPtr linePointer, WritingModes writingMode, PointF
      direction, Rectangle boundingBox, int charCount)
00817         {
00818             this.WritingMode = writingMode;
00819             this.Direction = direction;
00820             this.BoundingBox = boundingBox;
00821 
00822             IntPtr[] charPointers = new IntPtr[charCount];
00823             GCHandle charsHandle = GCHandle.Alloc(charPointers, GCHandleType.Pinned);
00824 
00825             try
00826             {
00827                 ExitCodes result = (ExitCodes)NativeMethods.GetStructuredTextChars(linePointer,
      charsHandle.AddrOfPinnedObject());
00828 
00829                 switch (result)
00830                 {
00831                     case ExitCodes.EXIT_SUCCESS:
00832                         break;
00833                     default:
00834                         throw new MuPDFException("Unknown error", result);
00835                 }
00836 
00837                 Characters = new MuPDFStructuredTextCharacter[charCount];
00838 
00839                 StringBuilder textBuilder = new StringBuilder(charCount);
00840 
00841                 for (int i = 0; i < charCount; i++)
00842                 {
00843                     int c = -1;
00844                     int color = -1;
00845                     float originX = -1;
00846                     float originY = -1;
00847                     float size = -1;
00848                     float llX = -1;
00849                     float llY = -1;
00850                     float ulX = -1;
00851                     float ulY = -1;
00852                     float urX = -1;
00853                     float urY = -1;
00854                     float lrX = -1;
00855                     float lrY = -1;
00856 
00857                     result = (ExitCodes)NativeMethods.GetStructuredTextChar(charPointers[i], ref c,
      ref color, ref originX, ref originY, ref size, ref llX, ref llY, ref ulX, ref ulY, ref urX, ref urY,
      ref lrX, ref lrY);
00858 
00859                     switch (result)
00860                     {
```

```
00861                       case ExitCodes.EXIT_SUCCESS:
00862                           break;
00863                       default:
00864                           throw new MuPDFException("Unknown error", result);
00865                   }
00866
00867                   Quad quad = new Quad(new PointF(llX, llY), new PointF(ulX, ulY), new PointF(urX,
      urY), new PointF(lrX, lrY));
00868                   PointF origin = new PointF(originX, originY);
00869
00870                   Characters[i] = new MuPDFStructuredTextCharacter(c, color, origin, quad, size);
00871                   textBuilder.Append(Characters[i].Character);
00872               }
00873
00874               this.Text = textBuilder.ToString();
00875           }
00876           finally
00877           {
00878               charsHandle.Free();
00879           }
00880       }
00881
00882       /// <summary>
00883       /// Returns a string representation of the line.
00884       /// </summary>
00885       /// <returns>A string representation of the line.</returns>
00886       public override string ToString()
00887       {
00888           return this.Text;
00889       }
00890
00891       /// <inheritdoc/>
00892       public IEnumerator<MuPDFStructuredTextCharacter> GetEnumerator()
00893       {
00894           return ((IEnumerable<MuPDFStructuredTextCharacter>)Characters).GetEnumerator();
00895       }
00896
00897       IEnumerator IEnumerable.GetEnumerator()
00898       {
00899           return Characters.GetEnumerator();
00900       }
00901   }
00902
00903   /// <summary>
00904   /// Represents a single text character.
00905   /// </summary>
00906   public class MuPDFStructuredTextCharacter
00907   {
00908       /// <summary>
00909       /// The unicode code point of the character.
00910       /// </summary>
00911       public int CodePoint { get; }
00912
00913       /// <summary>
00914       /// A string representation of the character. It may consist of a single <see cref="char"/> or
      of a surrogate pair of <see cref="char"/>s.
00915       /// </summary>
00916       public string Character { get; }
00917
00918       /// <summary>
00919       /// An sRGB hex representation of the colour of the character.
00920       /// </summary>
00921       public int Color { get; }
00922
00923       /// <summary>
00924       /// The baseline origin of the character.
00925       /// </summary>
00926       public PointF Origin { get; }
00927
00928       /// <summary>
00929       /// A quadrilater bound for the character. This may or may not be a rectangle.
00930       /// </summary>
00931       public Quad BoundingQuad { get; }
00932
00933       /// <summary>
00934       /// The size in points of the character.
00935       /// </summary>
00936       public float Size { get; }
00937
00938       internal MuPDFStructuredTextCharacter(int codePoint, int color, PointF origin, Quad
      boundingQuad, float size)
00939       {
00940           this.CodePoint = codePoint;
00941           this.Character = Char.ConvertFromUtf32(codePoint);
00942           this.Color = color;
00943           this.Origin = origin;
00944           this.BoundingQuad = boundingQuad;
```

```
00945             this.Size = size;
00946         }
00947 
00948         /// <summary>
00949         /// Returns a string representation of the character.
00950         /// </summary>
00951         /// <returns>A string representation of the character.</returns>
00952         public override string ToString()
00953         {
00954             return this.Character;
00955         }
00956     }
00957 
00958     /// <summary>
00959     /// Represents the address of a particular character in a <see cref="MuPDFStructuredTextPage"/>,
        in terms of block index, line index and character index.
00960     /// </summary>
00961     public struct MuPDFStructuredTextAddress : IComparable<MuPDFStructuredTextAddress>,
        IEquatable<MuPDFStructuredTextAddress>
00962     {
00963         /// <summary>
00964         /// The index of the block.
00965         /// </summary>
00966         public readonly int BlockIndex;
00967 
00968         /// <summary>
00969         /// The index of the line within the block.
00970         /// </summary>
00971         public readonly int LineIndex;
00972 
00973         /// <summary>
00974         /// The index of the character within the line.
00975         /// </summary>
00976         public readonly int CharacterIndex;
00977 
00978         /// <summary>
00979         /// Creates a new <see cref="MuPDFStructuredTextAddress"/> from the specified indices.
00980         /// </summary>
00981         /// <param name="blockIndex">The index of the block.</param>
00982         /// <param name="lineIndex">The index of the line within the block.</param>
00983         /// <param name="characterIndex">The index of the character within the line.</param>
00984         public MuPDFStructuredTextAddress(int blockIndex, int lineIndex, int characterIndex)
00985         {
00986             this.BlockIndex = blockIndex;
00987             this.LineIndex = lineIndex;
00988             this.CharacterIndex = characterIndex;
00989         }
00990 
00991         /// <summary>
00992         /// Compares this <see cref="MuPDFStructuredTextAddress"/> with another <see
        cref="MuPDFStructuredTextAddress"/>.
00993         /// </summary>
00994         /// <param name="other">The <see cref="MuPDFStructuredTextAddress"/> to compare with the
        current instance.</param>
00995         /// <returns>-1 if the <paramref name="other"/> <see cref="MuPDFStructuredTextAddress"/> comes
        after the current instance, 1 if it comes before, or 0 if they represent the same address.</returns>
00996         public int CompareTo(MuPDFStructuredTextAddress other)
00997         {
00998             if (this < other)
00999             {
01000                 return -1;
01001             }
01002             else if (this > other)
01003             {
01004                 return 1;
01005             }
01006             else
01007             {
01008                 return 0;
01009             }
01010         }
01011 
01012         /// <summary>
01013         /// Compares two <see cref="MuPDFStructuredTextAddress"/>.
01014         /// </summary>
01015         /// <param name="first">The first <see cref="MuPDFStructuredTextAddress"/> to compare.</param>
01016         /// <param name="second">The second <see cref="MuPDFStructuredTextAddress"/> to
        compare.</param>
01017         /// <returns><see langword="true"/> if the <paramref name="first"/> <see
        cref="MuPDFStructuredTextAddress"/> comes after the <paramref name="second"/> one; otherwise, <see
        langword="false"/>.</returns>
01018         public static bool operator >(MuPDFStructuredTextAddress first, MuPDFStructuredTextAddress
        second)
01019         {
01020             if (first.BlockIndex > second.BlockIndex)
01021             {
01022                 return true;
```

```
01023             }
01024             else if (first.BlockIndex < second.BlockIndex)
01025             {
01026                 return false;
01027             }
01028             else
01029             {
01030                 if (first.LineIndex > second.LineIndex)
01031                 {
01032                     return true;
01033                 }
01034                 else if (first.LineIndex < second.LineIndex)
01035                 {
01036                     return false;
01037                 }
01038                 else
01039                 {
01040                     if (first.CharacterIndex > second.CharacterIndex)
01041                     {
01042                         return true;
01043                     }
01044                     else
01045                     {
01046                         return false;
01047                     }
01048                 }
01049             }
01050         }
01051 
01052         /// <summary>
01053         /// Compares two <see cref="MuPDFStructuredTextAddress"/>.
01054         /// </summary>
01055         /// <param name="first">The first <see cref="MuPDFStructuredTextAddress"/> to compare.</param>
01056         /// <param name="second">The second <see cref="MuPDFStructuredTextAddress"/> to
      compare.</param>
01057         /// <returns><see langword="true"/> if the <paramref name="first"/> <see
      cref="MuPDFStructuredTextAddress"/> comes after the <paramref name="second"/> one or if they
      represent the same address; otherwise, <see langword="false"/>.</returns>
01058         public static bool operator >=(MuPDFStructuredTextAddress first, MuPDFStructuredTextAddress
      second)
01059         {
01060             if (first.BlockIndex > second.BlockIndex)
01061             {
01062                 return true;
01063             }
01064             else if (first.BlockIndex < second.BlockIndex)
01065             {
01066                 return false;
01067             }
01068             else
01069             {
01070                 if (first.LineIndex > second.LineIndex)
01071                 {
01072                     return true;
01073                 }
01074                 else if (first.LineIndex < second.LineIndex)
01075                 {
01076                     return false;
01077                 }
01078                 else
01079                 {
01080                     if (first.CharacterIndex >= second.CharacterIndex)
01081                     {
01082                         return true;
01083                     }
01084                     else
01085                     {
01086                         return false;
01087                     }
01088                 }
01089             }
01090         }
01091 
01092         /// <summary>
01093         /// Compares two <see cref="MuPDFStructuredTextAddress"/>.
01094         /// </summary>
01095         /// <param name="first">The first <see cref="MuPDFStructuredTextAddress"/> to compare.</param>
01096         /// <param name="second">The second <see cref="MuPDFStructuredTextAddress"/> to
      compare.</param>
01097         /// <returns><see langword="true"/> if the <paramref name="first"/> <see
      cref="MuPDFStructuredTextAddress"/> comes before the <paramref name="second"/> one; otherwise, <see
      langword="false"/>.</returns>
01098         public static bool operator <(MuPDFStructuredTextAddress first, MuPDFStructuredTextAddress
      second)
01099         {
01100             if (first.BlockIndex > second.BlockIndex)
01101             {
```

```
01102                 return false;
01103             }
01104             else if (first.BlockIndex < second.BlockIndex)
01105             {
01106                 return true;
01107             }
01108             else
01109             {
01110                 if (first.LineIndex > second.LineIndex)
01111                 {
01112                     return false;
01113                 }
01114                 else if (first.LineIndex < second.LineIndex)
01115                 {
01116                     return true;
01117                 }
01118                 else
01119                 {
01120                     if (first.CharacterIndex < second.CharacterIndex)
01121                     {
01122                         return true;
01123                     }
01124                     else
01125                     {
01126                         return false;
01127                     }
01128                 }
01129             }
01130         }
01131 
01132         /// <summary>
01133         /// Compares two <see cref="MuPDFStructuredTextAddress"/>.
01134         /// </summary>
01135         /// <param name="first">The first <see cref="MuPDFStructuredTextAddress"/> to compare.</param>
01136         /// <param name="second">The second <see cref="MuPDFStructuredTextAddress"/> to
      compare.</param>
01137         /// <returns><see langword="true"/> if the <paramref name="first"/> <see
      cref="MuPDFStructuredTextAddress"/> comes before the <paramref name="second"/> one or if they
      represent the same address; otherwise, <see langword="false"/>.</returns>
01138         public static bool operator <=(MuPDFStructuredTextAddress first, MuPDFStructuredTextAddress
      second)
01139         {
01140             if (first.BlockIndex > second.BlockIndex)
01141             {
01142                 return false;
01143             }
01144             else if (first.BlockIndex < second.BlockIndex)
01145             {
01146                 return true;
01147             }
01148             else
01149             {
01150                 if (first.LineIndex > second.LineIndex)
01151                 {
01152                     return false;
01153                 }
01154                 else if (first.LineIndex < second.LineIndex)
01155                 {
01156                     return true;
01157                 }
01158                 else
01159                 {
01160                     if (first.CharacterIndex <= second.CharacterIndex)
01161                     {
01162                         return true;
01163                     }
01164                     else
01165                     {
01166                         return false;
01167                     }
01168                 }
01169             }
01170         }
01171 
01172         /// <summary>
01173         /// Compares two <see cref="MuPDFStructuredTextAddress"/>.
01174         /// </summary>
01175         /// <param name="first">The first <see cref="MuPDFStructuredTextAddress"/> to compare.</param>
01176         /// <param name="second">The second <see cref="MuPDFStructuredTextAddress"/> to
      compare.</param>
01177         /// <returns><see langword="true"/> if the two <see cref="MuPDFStructuredTextAddress"/>es
      represent the same address; otherwise, <see langword="false"/>.</returns>
01178         public static bool operator ==(MuPDFStructuredTextAddress first, MuPDFStructuredTextAddress
      second)
01179         {
01180             return first.CharacterIndex == second.CharacterIndex && first.LineIndex ==
      second.LineIndex && first.BlockIndex == second.BlockIndex;
```

```
01181         }
01182
01183         /// <summary>
01184         /// Compares two <see cref="MuPDFStructuredTextAddress"/>.
01185         /// </summary>
01186         /// <param name="first">The first <see cref="MuPDFStructuredTextAddress"/> to compare.</param>
01187         /// <param name="second">The second <see cref="MuPDFStructuredTextAddress"/> to
      compare.</param>
01188         /// <returns><see langword="true"/> if the two <see cref="MuPDFStructuredTextAddress"/>es
      represent different addresses; otherwise, <see langword="false"/>.</returns>
01189         public static bool operator !=(MuPDFStructuredTextAddress first, MuPDFStructuredTextAddress
      second)
01190         {
01191             return first.CharacterIndex != second.CharacterIndex || first.LineIndex !=
      second.LineIndex || first.BlockIndex != second.BlockIndex;
01192         }
01193
01194         /// <inheritdoc/>
01195         public override int GetHashCode()
01196         {
01197             unchecked
01198             {
01199                 return ((this.BlockIndex * 33 * 33) ^ this.LineIndex * 33) ^ this.CharacterIndex;
01200             }
01201         }
01202
01203         /// <summary>
01204         /// Returns a <see cref="MuPDFStructuredTextAddress"/> corresponding to the next character in
      the specified page.
01205         /// </summary>
01206         /// <param name="page">The page the address refers to.</param>
01207         /// <returns>A <see cref="MuPDFStructuredTextAddress"/> corresponding to the next character in
      the specified page.</returns>
01208         public MuPDFStructuredTextAddress? Increment(MuPDFStructuredTextPage page)
01209         {
01210             int newBlockIndex = this.BlockIndex;
01211             int newLineIndex = this.LineIndex;
01212             int newCharacterIndex = this.CharacterIndex + 1;
01213
01214             if (page[newBlockIndex][newLineIndex].Count <= newCharacterIndex)
01215             {
01216                 newCharacterIndex = 0;
01217                 newLineIndex++;
01218             }
01219
01220             if (page[newBlockIndex].Count <= newLineIndex)
01221             {
01222                 newLineIndex = 0;
01223                 newBlockIndex++;
01224             }
01225
01226             if (page.Count <= newBlockIndex)
01227             {
01228                 return null;
01229             }
01230
01231             return new MuPDFStructuredTextAddress(newBlockIndex, newLineIndex, newCharacterIndex);
01232         }
01233
01234         /// <summary>
01235         /// Compares the current <see cref="MuPDFStructuredTextAddress"/> with another <see
      cref="MuPDFStructuredTextAddress"/>.
01236         /// </summary>
01237         /// <param name="other">The other <see cref="MuPDFStructuredTextAddress"/> to compare with the
      current instance.</param>
01238         /// <returns><see langword="true"/> if the two <see cref="MuPDFStructuredTextAddress"/>es
      represent the same address; otherwise, <see langword="false"/>.</returns>
01239         public bool Equals(MuPDFStructuredTextAddress other)
01240         {
01241             return this.CharacterIndex == other.CharacterIndex && this.LineIndex == other.LineIndex &&
      this.BlockIndex == other.BlockIndex;
01242         }
01243
01244         /// <inheritdoc/>
01245         public override bool Equals(object other)
01246         {
01247             return other is MuPDFStructuredTextAddress otherAddress && Equals(otherAddress);
01248         }
01249     }
01250
01251     /// <summary>
01252     /// Represents a range of characters in a <see cref="MuPDFStructuredTextPage"/>.
01253     /// </summary>
01254     public class MuPDFStructuredTextAddressSpan
01255     {
01256         /// <summary>
01257         /// The addres of the start of the range.
```

```
01258         /// </summary>
01259         public readonly MuPDFStructuredTextAddress Start;
01260
01261         /// <summary>
01262         /// The address of the end of the range (inclusive), or <see langword="null" /> to signify an
      empty range.
01263         /// </summary>
01264         public readonly MuPDFStructuredTextAddress? End;
01265
01266         /// <summary>
01267         /// Creates a new <see cref="MuPDFStructuredTextAddressSpan"/> corresponding to the specified
      character range.
01268         /// </summary>
01269         /// <param name="start">The addres of the start of the range.</param>
01270         /// <param name="end">The address of the end of the range (inclusive), or <see langword="null"
      /> to signify an empty range.</param>
01271         public MuPDFStructuredTextAddressSpan(MuPDFStructuredTextAddress start,
      MuPDFStructuredTextAddress? end)
01272         {
01273             this.Start = start;
01274             this.End = end;
01275         }
01276     }
01277 }
```

8.11 Rectangles.cs

```
00001 /*
00002     MuPDFCore - A set of multiplatform .NET Core bindings for MuPDF.
00003     Copyright (C) 2020  Giorgio Bianchini
00004
00005     This program is free software: you can redistribute it and/or modify
00006     it under the terms of the GNU Affero General Public License as
00007     published by the Free Software Foundation, version 3.
00008
00009     This program is distributed in the hope that it will be useful,
00010     but WITHOUT ANY WARRANTY; without even the implied warranty of
00011     MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.  See the
00012     GNU Affero General Public License for more details.
00013
00014     You should have received a copy of the GNU Affero General Public License
00015     along with this program.  If not, see <http://www.gnu.org/licenses/>
00016 */
00017
00018 using System;
00019
00020 namespace MuPDFCore
00021 {
00022     /// <summary>
00023     /// Represents the size of a rectangle.
00024     /// </summary>
00025     public struct Size
00026     {
00027         /// <summary>
00028         /// The width of the rectangle.
00029         /// </summary>
00030         public float Width;
00031
00032         /// <summary>
00033         /// The height of the rectangle.
00034         /// </summary>
00035         public float Height;
00036
00037         /// <summary>
00038         /// Create a new <see cref="Size"/> with the specified width and height.
00039         /// </summary>
00040         /// <param name="width">The width of the rectangle.</param>
00041         /// <param name="height">The height of the rectangle.</param>
00042         public Size(float width, float height)
00043         {
00044             Width = width;
00045             Height = height;
00046         }
00047
00048         /// <summary>
00049         /// Create a new <see cref="Size"/> with the specified width and height.
00050         /// </summary>
00051         /// <param name="width">The width of the rectangle.</param>
00052         /// <param name="height">The height of the rectangle.</param>
00053         public Size(double width, double height)
00054         {
00055             Width = (float)width;
00056             Height = (float)height;
```

```
00057         }
00058
00059         /// <summary>
00060         /// Split the size into the specified number of <see cref="Rectangle"/>s.
00061         /// </summary>
00062         /// <param name="divisions">The number of rectangles in which the size should be split. This
      must be factorisable using only powers of 2, 3, 5 or 7. Otherwise, the biggest number smaller than
      <paramref name="divisions"/> that satisfies this condition is used.</param>
00063         /// <returns>An array of <see cref="Rectangle"/>s that when positioned properly cover an area
      of the size of this object.</returns>
00064         public Rectangle[] Split(int divisions)
00065         {
00066             divisions = Utils.GetAcceptableNumber(divisions);
00067
00068             Rectangle[] tbr = new Rectangle[divisions];
00069
00070             bool isVertical = this.Height > this.Width;
00071
00072             if (divisions == 1)
00073             {
00074                 tbr[0] = new Rectangle(0, 0, Width, Height);
00075             }
00076             else if (divisions == 2)
00077             {
00078                 if (isVertical)
00079                 {
00080                     tbr[0] = new Rectangle(0, 0, Width, Height / 2);
00081                     tbr[1] = new Rectangle(0, Height / 2, Width, Height);
00082                 }
00083                 else
00084                 {
00085                     tbr[0] = new Rectangle(0, 0, Width / 2, Height);
00086                     tbr[1] = new Rectangle(Width / 2, 0, Width, Height);
00087                 }
00088             }
00089             else if (divisions == 3)
00090             {
00091                 if (isVertical)
00092                 {
00093                     tbr[0] = new Rectangle(0, 0, Width / 2, 2 * Height / 3);
00094                     tbr[1] = new Rectangle(Width / 2, 0, Width, 2 * Height / 3);
00095                     tbr[2] = new Rectangle(0, 2 * Height / 3, Width, Height);
00096                 }
00097                 else
00098                 {
00099                     tbr[0] = new Rectangle(0, 0, 2 * Width / 3, Height / 2);
00100                     tbr[1] = new Rectangle(0, Height / 2, 2 * Width / 3, Height);
00101                     tbr[2] = new Rectangle(2 * Width / 3, 0, Width, Height);
00102                 }
00103             }
00104             else if (divisions == 5)
00105             {
00106                 if (isVertical)
00107                 {
00108                     tbr[0] = new Rectangle(0, 0, Width / 2, 2 * Height / 5);
00109                     tbr[1] = new Rectangle(Width / 2, 0, Width, 2 * Height / 5);
00110                     tbr[2] = new Rectangle(0, 2 * Height / 5, Width / 2, 4 * Height / 5);
00111                     tbr[3] = new Rectangle(Width / 2, 2 * Height / 5, Width, 4 * Height / 5);
00112                     tbr[4] = new Rectangle(0, 4 * Height / 5, Width, Height);
00113                 }
00114                 else
00115                 {
00116                     tbr[0] = new Rectangle(0, 0, 2 * Width / 5, Height / 2);
00117                     tbr[1] = new Rectangle(0, Height / 2, 2 * Width / 5, Height);
00118                     tbr[2] = new Rectangle(2 * Width / 5, 0, 4 * Width / 5, Height / 2);
00119                     tbr[3] = new Rectangle(2 * Width / 5, Height / 2, 4 * Width / 5, Height);
00120                     tbr[4] = new Rectangle(4 * Width / 5, 0, Width, Height);
00121                 }
00122             }
00123             else if (divisions == 7)
00124             {
00125                 if (isVertical)
00126                 {
00127                     tbr[0] = new Rectangle(0, 0, Width / 2, 2 * Height / 7);
00128                     tbr[1] = new Rectangle(Width / 2, 0, Width, 2 * Height / 7);
00129                     tbr[2] = new Rectangle(0, 2 * Height / 7, Width / 2, 4 * Height / 7);
00130                     tbr[3] = new Rectangle(Width / 2, 2 * Height / 7, Width, 4 * Height / 7);
00131                     tbr[4] = new Rectangle(0, 4 * Height / 7, Width / 2, 6 * Height / 7);
00132                     tbr[5] = new Rectangle(Width / 2, 4 * Height / 7, Width, 6 * Height / 7);
00133                     tbr[6] = new Rectangle(0, 6 * Height / 7, Width, Height);
00134                 }
00135                 else
00136                 {
00137                     tbr[0] = new Rectangle(0, 0, 2 * Width / 7, Height / 2);
00138                     tbr[1] = new Rectangle(0, Height / 2, 2 * Width / 7, Height);
00139                     tbr[2] = new Rectangle(2 * Width / 7, 0, 4 * Width / 7, Height / 2);
00140                     tbr[3] = new Rectangle(2 * Width / 7, Height / 2, 4 * Width / 7, Height);
```

```
00141                   tbr[4] = new Rectangle(4 * Width / 7, 0, 6 * Width / 7, Height / 2);
00142                   tbr[5] = new Rectangle(4 * Width / 7, Height / 2, 6 * Width / 7, Height);
00143                   tbr[6] = new Rectangle(6 * Width / 7, 0, Width, Height);
00144               }
00145           }
00146           else
00147           {
00148               for (int divisorInd = 0; divisorInd < Utils.AcceptableDivisors.Length; divisorInd++)
00149               {
00150                   if (divisions % Utils.AcceptableDivisors[divisorInd] == 0)
00151                   {
00152                       Rectangle[] largerDivisions = this.Split(divisions /
    Utils.AcceptableDivisors[divisorInd]);
00153
00154                       int pos = 0;
00155
00156                       for (int i = 0; i < largerDivisions.Length; i++)
00157                       {
00158                           Size s = new Size(largerDivisions[i].Width, largerDivisions[i].Height);
00159                           Rectangle[] currDivision = s.Split(Utils.AcceptableDivisors[divisorInd]);
00160
00161                           for (int j = 0; j < currDivision.Length; j++)
00162                           {
00163                               tbr[pos] = new Rectangle(largerDivisions[i].X0 + currDivision[j].X0,
    largerDivisions[i].Y0 + currDivision[j].Y0, largerDivisions[i].X0 + currDivision[j].X1,
    largerDivisions[i].Y0 + currDivision[j].Y1);
00164                               pos++;
00165                           }
00166                       }
00167
00168                       break;
00169                   }
00170               }
00171           }
00172
00173           return tbr;
00174
00175       }
00176   }
00177
00178   /// <summary>
00179   /// Represents the size of a rectangle using only integer numbers.
00180   /// </summary>
00181   public struct RoundedSize
00182   {
00183       /// <summary>
00184       /// The width of the rectangle.
00185       /// </summary>
00186       public int Width;
00187
00188       /// <summary>
00189       /// The height of the rectangle.
00190       /// </summary>
00191       public int Height;
00192
00193       /// <summary>
00194       /// Create a new <see cref="RoundedSize"/> with the specified width and height.
00195       /// </summary>
00196       /// <param name="width">The width of the rectangle.</param>
00197       /// <param name="height">The height of the rectangle.</param>
00198       public RoundedSize(int width, int height)
00199       {
00200           Width = width;
00201           Height = height;
00202       }
00203
00204       /// <summary>
00205       /// Split the size into the specified number of <see cref="RoundedRectangle"/>s.
00206       /// </summary>
00207       /// <param name="divisions">The number of rectangles in which the size should be split. This
    must be factorisable using only powers of 2, 3, 5 or 7. Otherwise, the biggest number smaller than
    <paramref name="divisions"/> that satisfies this condition is used.</param>
00208       /// <returns>An array of <see cref="RoundedRectangle"/>s that when positioned properly cover
    an area of the size of this object.</returns>
00209       public RoundedRectangle[] Split(int divisions)
00210       {
00211           divisions = Utils.GetAcceptableNumber(divisions);
00212
00213           RoundedRectangle[] tbr = new RoundedRectangle[divisions];
00214
00215           bool isVertical = this.Height > this.Width;
00216
00217           if (divisions == 1)
00218           {
00219               tbr[0] = new RoundedRectangle(0, 0, Width, Height);
00220           }
00221           else if (divisions == 2)
```

```
00222             {
00223                 if (isVertical)
00224                 {
00225                     tbr[0] = new RoundedRectangle(0, 0, Width, Height / 2);
00226                     tbr[1] = new RoundedRectangle(0, Height / 2, Width, Height);
00227                 }
00228                 else
00229                 {
00230                     tbr[0] = new RoundedRectangle(0, 0, Width / 2, Height);
00231                     tbr[1] = new RoundedRectangle(Width / 2, 0, Width, Height);
00232                 }
00233             }
00234             else if (divisions == 3)
00235             {
00236                 if (isVertical)
00237                 {
00238                     tbr[0] = new RoundedRectangle(0, 0, Width / 2, 2 * Height / 3);
00239                     tbr[1] = new RoundedRectangle(Width / 2, 0, Width, 2 * Height / 3);
00240                     tbr[2] = new RoundedRectangle(0, 2 * Height / 3, Width, Height);
00241                 }
00242                 else
00243                 {
00244                     tbr[0] = new RoundedRectangle(0, 0, 2 * Width / 3, Height / 2);
00245                     tbr[1] = new RoundedRectangle(0, Height / 2, 2 * Width / 3, Height);
00246                     tbr[2] = new RoundedRectangle(2 * Width / 3, 0, Width, Height);
00247                 }
00248             }
00249             else if (divisions == 5)
00250             {
00251                 if (isVertical)
00252                 {
00253                     tbr[0] = new RoundedRectangle(0, 0, Width / 2, 2 * Height / 5);
00254                     tbr[1] = new RoundedRectangle(Width / 2, 0, Width, 2 * Height / 5);
00255                     tbr[2] = new RoundedRectangle(0, 2 * Height / 5, Width / 2, 4 * Height / 5);
00256                     tbr[3] = new RoundedRectangle(Width / 2, 2 * Height / 5, Width, 4 * Height / 5);
00257                     tbr[4] = new RoundedRectangle(0, 4 * Height / 5, Width, Height);
00258                 }
00259                 else
00260                 {
00261                     tbr[0] = new RoundedRectangle(0, 0, 2 * Width / 5, Height / 2);
00262                     tbr[1] = new RoundedRectangle(0, Height / 2, 2 * Width / 5, Height);
00263                     tbr[2] = new RoundedRectangle(2 * Width / 5, 0, 4 * Width / 5, Height / 2);
00264                     tbr[3] = new RoundedRectangle(2 * Width / 5, Height / 2, 4 * Width / 5, Height);
00265                     tbr[4] = new RoundedRectangle(4 * Width / 5, 0, Width, Height);
00266                 }
00267             }
00268             else if (divisions == 7)
00269             {
00270                 if (isVertical)
00271                 {
00272                     tbr[0] = new RoundedRectangle(0, 0, Width / 2, 2 * Height / 7);
00273                     tbr[1] = new RoundedRectangle(Width / 2, 0, Width, 2 * Height / 7);
00274                     tbr[2] = new RoundedRectangle(0, 2 * Height / 7, Width / 2, 4 * Height / 7);
00275                     tbr[3] = new RoundedRectangle(Width / 2, 2 * Height / 7, Width, 4 * Height / 7);
00276                     tbr[4] = new RoundedRectangle(0, 4 * Height / 7, Width / 2, 6 * Height / 7);
00277                     tbr[5] = new RoundedRectangle(Width / 2, 4 * Height / 7, Width, 6 * Height / 7);
00278                     tbr[6] = new RoundedRectangle(0, 6 * Height / 7, Width, Height);
00279                 }
00280                 else
00281                 {
00282                     tbr[0] = new RoundedRectangle(0, 0, 2 * Width / 7, Height / 2);
00283                     tbr[1] = new RoundedRectangle(0, Height / 2, 2 * Width / 7, Height);
00284                     tbr[2] = new RoundedRectangle(2 * Width / 7, 0, 4 * Width / 7, Height / 2);
00285                     tbr[3] = new RoundedRectangle(2 * Width / 7, Height / 2, 4 * Width / 7, Height);
00286                     tbr[4] = new RoundedRectangle(4 * Width / 7, 0, 6 * Width / 7, Height / 2);
00287                     tbr[5] = new RoundedRectangle(4 * Width / 7, Height / 2, 6 * Width / 7, Height);
00288                     tbr[6] = new RoundedRectangle(6 * Width / 7, 0, Width, Height);
00289                 }
00290             }
00291             else
00292             {
00293                 for (int divisorInd = 0; divisorInd < Utils.AcceptableDivisors.Length; divisorInd++)
00294                 {
00295                     if (divisions % Utils.AcceptableDivisors[divisorInd] == 0)
00296                     {
00297                         RoundedRectangle[] largerDivisions = this.Split(divisions /
    Utils.AcceptableDivisors[divisorInd]);
00298
00299                         int pos = 0;
00300
00301                         for (int i = 0; i < largerDivisions.Length; i++)
00302                         {
00303                             RoundedSize s = new RoundedSize(largerDivisions[i].Width,
    largerDivisions[i].Height);
00304                             RoundedRectangle[] currDivision =
    s.Split(Utils.AcceptableDivisors[divisorInd]);
00305
```

```
00306                             for (int j = 0; j < currDivision.Length; j++)
00307                             {
00308                                 tbr[pos] = new RoundedRectangle(largerDivisions[i].X0 +
      currDivision[j].X0, largerDivisions[i].Y0 + currDivision[j].Y0, largerDivisions[i].X0 +
      currDivision[j].X1, largerDivisions[i].Y0 + currDivision[j].Y1);
00309                                 pos++;
00310                             }
00311                         }
00312
00313                         break;
00314                     }
00315                 }
00316             }
00317
00318             return tbr;
00319
00320         }
00321     }
00322
00323     /// <summary>
00324     /// Represents a rectangle.
00325     /// </summary>
00326     public struct Rectangle
00327     {
00328         /// <summary>
00329         /// The left coordinate of the rectangle.
00330         /// </summary>
00331         public float X0;
00332
00333         /// <summary>
00334         /// The top coordinate of the rectangle.
00335         /// </summary>
00336         public float Y0;
00337
00338         /// <summary>
00339         /// The right coordinate of the rectangle.
00340         /// </summary>
00341         public float X1;
00342
00343         /// <summary>
00344         /// The bottom coordinate of the rectangle.
00345         /// </summary>
00346         public float Y1;
00347
00348         /// <summary>
00349         /// The width of the rectangle.
00350         /// </summary>
00351         public float Width => X1 - X0;
00352
00353         /// <summary>
00354         /// The height of the rectangle.
00355         /// </summary>
00356         public float Height => Y1 - Y0;
00357
00358         /// <summary>
00359         /// Create a new <see cref="Rectangle"/> from the specified coordinates.
00360         /// </summary>
00361         /// <param name="x0">The left coordinate of the rectangle.</param>
00362         /// <param name="y0">The top coordinate of the rectangle.</param>
00363         /// <param name="x1">The right coordinate of the rectangle.</param>
00364         /// <param name="y1">The bottom coordinate of the rectangle.</param>
00365         public Rectangle(float x0, float y0, float x1, float y1)
00366         {
00367             X0 = x0;
00368             Y0 = y0;
00369             X1 = x1;
00370             Y1 = y1;
00371         }
00372
00373         /// <summary>
00374         /// Create a new <see cref="Rectangle"/> from the specified coordinates.
00375         /// </summary>
00376         /// <param name="x0">The left coordinate of the rectangle.</param>
00377         /// <param name="y0">The top coordinate of the rectangle.</param>
00378         /// <param name="x1">The right coordinate of the rectangle.</param>
00379         /// <param name="y1">The bottom coordinate of the rectangle.</param>
00380         public Rectangle(double x0, double y0, double x1, double y1)
00381         {
00382             X0 = (float)x0;
00383             Y0 = (float)y0;
00384             X1 = (float)x1;
00385             Y1 = (float)y1;
00386         }
00387
00388         /// <summary>
00389         /// Round the rectangle's coordinates to the closest integers.
00390         /// </summary>
```

```
00391         /// <returns>A <see cref="RoundedRectangle"/> with the rounded coordinates.</returns>
00392         public RoundedRectangle Round()
00393         {
00394             return new RoundedRectangle(
00395                 (int)Math.Floor(X0 + 0.001),
00396                 (int)Math.Floor(Y0 + 0.001),
00397                 (int)Math.Ceiling(X1 - 0.001),
00398                 (int)Math.Ceiling(Y1 - 0.001)
00399             );
00400         }
00401 
00402         /// <summary>
00403         /// Round the rectangle's coordinates to the closest integers, applying the specified zoom
      factor.
00404         /// </summary>
00405         /// <param name="zoom">The zoom factor to apply.</param>
00406         /// <returns>A <see cref="RoundedRectangle"/> with the rounded coordinates.</returns>
00407         public RoundedRectangle Round(double zoom)
00408         {
00409             return new RoundedRectangle(
00410                 (int)Math.Floor(X0 * (float)zoom + 0.001),
00411                 (int)Math.Floor(Y0 * (float)zoom + 0.001),
00412                 (int)Math.Ceiling(X1 * (float)zoom - 0.001),
00413                 (int)Math.Ceiling(Y1 * (float)zoom - 0.001)
00414             );
00415         }
00416 
00417         /// <summary>
00418         /// Split the rectangle into the specified number of <see cref="Rectangle"/>s.
00419         /// </summary>
00420         /// <param name="divisions">The number of rectangles in which the rectangle should be split.
      This must be factorisable using only powers of 2, 3, 5 or 7. Otherwise, the biggest number smaller
      than <paramref name="divisions"/> that satisfies this condition is used.</param>
00421         /// <returns>An array of <see cref="Rectangle"/>s that when positioned properly cover the same
      area as this object.</returns>
00422         public Rectangle[] Split(int divisions)
00423         {
00424             Size s = new Size(this.Width, this.Height);
00425 
00426             Rectangle[] splitSize = s.Split(divisions);
00427 
00428             Rectangle[] tbr = new Rectangle[divisions];
00429 
00430             for (int i = 0; i < splitSize.Length; i++)
00431             {
00432                 tbr[i] = new Rectangle(this.X0 + splitSize[i].X0, this.Y0 + splitSize[i].Y0, this.X0 +
      splitSize[i].X1, this.Y0 + splitSize[i].Y1);
00433             }
00434 
00435             return tbr;
00436         }
00437 
00438         /// <summary>
00439         /// Compute the intersection between this <see cref="Rectangle"/> and another one.
00440         /// </summary>
00441         /// <param name="other">The other <see cref="Rectangle"/> to intersect with this
      instance.</param>
00442         /// <returns>The intersection between the two <see cref="Rectangle"/>s.</returns>
00443         public Rectangle Intersect(Rectangle other)
00444         {
00445             float x0 = Math.Max(this.X0, other.X0);
00446             float y0 = Math.Max(this.Y0, other.Y0);
00447 
00448             float x1 = Math.Min(this.X1, other.X1);
00449             float y1 = Math.Min(this.Y1, other.Y1);
00450 
00451             if (x1 <= x0 || y1 <= y0)
00452             {
00453                 return new Rectangle(0, 0, 0, 0);
00454             }
00455             else
00456             {
00457                 return new Rectangle(x0, y0, x1, y1);
00458             }
00459         }
00460 
00461         /// <summary>
00462         /// Checks whether this <see cref="Rectangle"/> contains another <see cref="Rectangle"/>.
00463         /// </summary>
00464         /// <param name="other">The <see cref="Rectangle"/> to check.</param>
00465         /// <returns>A boolean value indicating whether this <see cref="Rectangle"/> contains the
      <paramref name="other"/> <see cref="Rectangle"/>.</returns>
00466         public bool Contains(Rectangle other)
00467         {
00468             return other.X0 >= this.X0 && other.X1 <= this.X1 && other.Y0 >= this.Y0 && other.Y1 <=
      this.Y1;
00469         }
```

```
00470
00471         /// <summary>
00472         /// Checks whether this <see cref="Rectangle"/> contains a <see cref="PointF"/>.
00473         /// </summary>
00474         /// <param name="point">The <see cref="PointF"/> to check.</param>
00475         /// <returns>A boolean value indicating whether this <see cref="Rectangle"/> contains the
      <paramref name="point"/>.</returns>
00476         public bool Contains(PointF point)
00477         {
00478             return point.X >= this.X0 && point.X <= this.X1 && point.Y >= this.Y0 && point.Y <=
      this.Y1;
00479         }
00480
00481         /// <summary>
00482         /// Converts the <see cref="Rectangle"/> to a <see cref="Quad"/>.
00483         /// </summary>
00484         /// <returns>A <see cref="Quad"/> corresponding to the current <see
      cref="Rectangle"/>.</returns>
00485         public Quad ToQuad()
00486         {
00487             return new Quad(new PointF(X0, Y1), new PointF(X0, Y0), new PointF(X1, Y0), new PointF(X1,
      Y1));
00488         }
00489     }
00490
00491     /// <summary>
00492     /// Represents a rectangle using only integer numbers.
00493     /// </summary>
00494     public struct RoundedRectangle
00495     {
00496         /// <summary>
00497         /// The left coordinate of the rectangle.
00498         /// </summary>
00499         public int X0;
00500
00501         /// <summary>
00502         /// The top coordinate of the rectangle.
00503         /// </summary>
00504         public int Y0;
00505
00506         /// <summary>
00507         /// The right coordinate of the rectangle.
00508         /// </summary>
00509         public int X1;
00510
00511         /// <summary>
00512         /// The bottom coordinate of the rectangle.
00513         /// </summary>
00514         public int Y1;
00515
00516         /// <summary>
00517         /// The width of the rectangle.
00518         /// </summary>
00519         public int Width => X1 - X0;
00520
00521         /// <summary>
00522         /// The height of the rectangle.
00523         /// </summary>
00524         public int Height => Y1 - Y0;
00525
00526         /// <summary>
00527         /// Create a new <see cref="RoundedRectangle"/> from the specified coordinates.
00528         /// </summary>
00529         /// <param name="x0">The left coordinate of the rectangle.</param>
00530         /// <param name="y0">The top coordinate of the rectangle.</param>
00531         /// <param name="x1">The right coordinate of the rectangle.</param>
00532         /// <param name="y1">The bottom coordinate of the rectangle.</param>
00533         public RoundedRectangle(int x0, int y0, int x1, int y1)
00534         {
00535             X0 = x0;
00536             Y0 = y0;
00537             X1 = x1;
00538             Y1 = y1;
00539         }
00540
00541         /// <summary>
00542         /// Split the rectangle into the specified number of <see cref="RoundedRectangle"/>s.
00543         /// </summary>
00544         /// <param name="divisions">The number of rectangles in which the rectangle should be split.
      This must be factorisable using only powers of 2, 3, 5 or 7. Otherwise, the biggest number smaller
      than <paramref name="divisions"/> that satisfies this condition is used.</param>
00545         /// <returns>An array of <see cref="RoundedRectangle"/>s that when positioned properly cover
      the same area as this object.</returns>
00546         public RoundedRectangle[] Split(int divisions)
00547         {
00548             RoundedSize s = new RoundedSize(this.Width, this.Height);
00549
```

```
00550             RoundedRectangle[] splitSize = s.Split(divisions);
00551
00552             RoundedRectangle[] tbr = new RoundedRectangle[divisions];
00553
00554             for (int i = 0; i < splitSize.Length; i++)
00555             {
00556                 tbr[i] = new RoundedRectangle(this.X0 + splitSize[i].X0, this.Y0 + splitSize[i].Y0,
      this.X0 + splitSize[i].X1, this.Y0 + splitSize[i].Y1);
00557             }
00558
00559             return tbr;
00560         }
00561     }
00562
00563     /// <summary>
00564     /// Represents a point.
00565     /// </summary>
00566     public struct PointF
00567     {
00568         /// <summary>
00569         /// The horizontal coordinate of the point.
00570         /// </summary>
00571         public float X;
00572
00573         /// <summary>
00574         /// The vertical coordinate of the point.
00575         /// </summary>
00576         public float Y;
00577
00578         /// <summary>
00579         /// Create a new <see cref="PointF"/> from the specified coordinates.
00580         /// </summary>
00581         /// <param name="x">The horizontal coordinate of the point.</param>
00582         /// <param name="y">The vertical coordinate of the point.</param>
00583         public PointF(float x, float y)
00584         {
00585             X = x;
00586             Y = y;
00587         }
00588     }
00589
00590     /// <summary>
00591     /// Represents a quadrilater (not necessarily a rectangle).
00592     /// </summary>
00593     public struct Quad
00594     {
00595         /// <summary>
00596         /// The lower left point of the quadrilater.
00597         /// </summary>
00598         public PointF LowerLeft;
00599
00600         /// <summary>
00601         /// The upper left point of the quadrilater.
00602         /// </summary>
00603         public PointF UpperLeft;
00604
00605         /// <summary>
00606         /// The upper right point of the quadrilater.
00607         /// </summary>
00608         public PointF UpperRight;
00609
00610         /// <summary>
00611         /// The lower right point of the quadrilater.
00612         /// </summary>
00613         public PointF LowerRight;
00614
00615         /// <summary>
00616         /// Creates a new <see cref="Quad"/> from the specified points.
00617         /// </summary>
00618         /// <param name="lowerLeft">The lower left point of the quadrilater.</param>
00619         /// <param name="upperLeft">The upper left point of the quadrilater.</param>
00620         /// <param name="upperRight">The upper right point of the quadrilater.</param>
00621         /// <param name="lowerRight">The lower right point of the quadrilater.</param>
00622         public Quad(PointF lowerLeft, PointF upperLeft, PointF upperRight, PointF lowerRight)
00623         {
00624             this.LowerLeft = lowerLeft;
00625             this.UpperLeft = upperLeft;
00626             this.UpperRight = upperRight;
00627             this.LowerRight = lowerRight;
00628         }
00629
00630         /// <summary>
00631         /// Checks whether this <see cref="Quad"/> contains a <see cref="PointF"/>.
00632         /// </summary>
00633         /// <param name="point">The <see cref="PointF"/> to check.</param>
00634         /// <returns>A boolean value indicating whether this <see cref="Quad"/> contains the <paramref
      name="point"/>.</returns>
```

```
00635         public bool Contains(PointF point)
00636         {
00637             return PointInTriangle(point, this.LowerLeft, this.UpperLeft, this.UpperRight) ||
      PointInTriangle(point, this.LowerLeft, this.UpperRight, this.LowerRight);
00638         }
00639 
00640         /// <summary>
00641         /// Checks whether a point is contained in a triangle.
00642         /// </summary>
00643         /// <param name="pt">The point to test.</param>
00644         /// <param name="A">The first vertex of the triangle.</param>
00645         /// <param name="B">The second vertex of the triangle.</param>
00646         /// <param name="C">The third vertex of the triangle.</param>
00647         /// <returns>A boolean value indicating whether the point is contained in the
      triangle.</returns>
00648         private static bool PointInTriangle(PointF pt, PointF A, PointF B, PointF C)
00649         {
00650             double signAB = (pt.X - B.X) * (A.Y - B.Y) - (A.X - B.X) * (pt.Y - B.Y);
00651             double signBC = (pt.X - C.X) * (B.Y - C.Y) - (B.X - C.X) * (pt.Y - C.Y);
00652             double signCA = (pt.X - A.X) * (C.Y - A.Y) - (C.X - A.X) * (pt.Y - A.Y);
00653 
00654             return !((signAB < 0 || signBC < 0 || signCA < 0) && (signAB > 0 || signBC > 0 || signCA >
      0));
00655         }
00656     }
00657 }
```

8.12 TesseractLanguage.cs

```
00001 using System;
00002 using System.Collections.Generic;
00003 using System.IO;
00004 using System.Net;
00005 using System.Reflection;
00006 using System.Text;
00007 
00008 namespace MuPDFCore
00009 {
00010     /// <summary>
00011     /// Represents a language used by Tesseract OCR.
00012     /// </summary>
00013     public class TesseractLanguage
00014     {
00015         /// <summary>
00016         /// The name of the folder where the language file is located.
00017         /// </summary>
00018         public string Prefix { get; }
00019 
00020         /// <summary>
00021         /// The name of the language. The Tesseract library will assume that the trained language data
      file can be found at <c>Prefix/Language.traineddata</c>.
00022         /// </summary>
00023         public string Language { get; }
00024 
00025         /// <summary>
00026         /// Fast integer versions of trained models. These are models for a single language.
00027         /// </summary>
00028         public enum Fast
00029         {
00030             /// <summary>
00031             /// The Afrikaans language.
00032             /// </summary>
00033             Afr,
00034             /// <summary>
00035             /// The Amharic language.
00036             /// </summary>
00037             Amh,
00038             /// <summary>
00039             /// The Arabic language.
00040             /// </summary>
00041             Ara,
00042             /// <summary>
00043             /// The Assamese language.
00044             /// </summary>
00045             Asm,
00046             /// <summary>
00047             /// The Azerbaijani language.
00048             /// </summary>
00049             Aze,
00050             /// <summary>
00051             /// The Azerbaijani language (Cyrillic).
00052             /// </summary>
00053             Aze_Cyrl,
```

```
00054             /// <summary>
00055             /// The Belarusian language.
00056             /// </summary>
00057             Bel,
00058             /// <summary>
00059             /// The Bengali language.
00060             /// </summary>
00061             Ben,
00062             /// <summary>
00063             /// The Tibetan language.
00064             /// </summary>
00065             Bod,
00066             /// <summary>
00067             /// The Bosnian language.
00068             /// </summary>
00069             Bos,
00070             /// <summary>
00071             /// The Breton language.
00072             /// </summary>
00073             Bre,
00074             /// <summary>
00075             /// The Bulgarian language.
00076             /// </summary>
00077             Bul,
00078             /// <summary>
00079             /// The Catalan/Valencian language.
00080             /// </summary>
00081             Cat,
00082             /// <summary>
00083             /// The Cebuano language.
00084             /// </summary>
00085             Ceb,
00086             /// <summary>
00087             /// The Czech language.
00088             /// </summary>
00089             Ces,
00090             /// <summary>
00091             /// The Chinese (Simplified) language.
00092             /// </summary>
00093             Chi_Sim,
00094             /// <summary>
00095             /// The Chinese (Simplified) language (vertical).
00096             /// </summary>
00097             Chi_Sim_Vert,
00098             /// <summary>
00099             /// The Chinese (Traditional) language.
00100             /// </summary>
00101             Chi_Tra,
00102             /// <summary>
00103             /// The Chinese (Traditional) language (vertical).
00104             /// </summary>
00105             Chi_Tra_Vert,
00106             /// <summary>
00107             /// The Cherokee language.
00108             /// </summary>
00109             Chr,
00110             /// <summary>
00111             /// The Corsican language.
00112             /// </summary>
00113             Cos,
00114             /// <summary>
00115             /// The Welsh language.
00116             /// </summary>
00117             Cym,
00118             /// <summary>
00119             /// The Danish language.
00120             /// </summary>
00121             Dan,
00122             /// <summary>
00123             /// The German language.
00124             /// </summary>
00125             Deu,
00126             /// <summary>
00127             /// The Divehi/Dhivehi/Maldivian language.
00128             /// </summary>
00129             Div,
00130             /// <summary>
00131             /// The Dzongkha language.
00132             /// </summary>
00133             Dzo,
00134             /// <summary>
00135             /// The Greek, Modern (1453-) language.
00136             /// </summary>
00137             Ell,
00138             /// <summary>
00139             /// The English language.
00140             /// </summary>
```

```
00141             Eng,
00142             /// <summary>
00143             /// The English, Middle (1100-1500) language.
00144             /// </summary>
00145             Enm,
00146             /// <summary>
00147             /// The Esperanto language.
00148             /// </summary>
00149             Epo,
00150             /// <summary>
00151             /// A language for equations.
00152             /// </summary>
00153             Equ,
00154             /// <summary>
00155             /// The Estonian language.
00156             /// </summary>
00157             Est,
00158             /// <summary>
00159             /// The Basque language.
00160             /// </summary>
00161             Eus,
00162             /// <summary>
00163             /// The Faroese language.
00164             /// </summary>
00165             Fao,
00166             /// <summary>
00167             /// The Persian language.
00168             /// </summary>
00169             Fas,
00170             /// <summary>
00171             /// The Filipino/Pilipino language.
00172             /// </summary>
00173             Fil,
00174             /// <summary>
00175             /// The Finnish language.
00176             /// </summary>
00177             Fin,
00178             /// <summary>
00179             /// The French language.
00180             /// </summary>
00181             Fra,
00182             /// <summary>
00183             /// The German - Fraktur language.
00184             /// </summary>
00185             Frk,
00186             /// <summary>
00187             /// The French, Middle (ca.1400-1600) language.
00188             /// </summary>
00189             Frm,
00190             /// <summary>
00191             /// The Western Frisian language.
00192             /// </summary>
00193             Fry,
00194             /// <summary>
00195             /// The Gaelic/Scottish Gaelic language.
00196             /// </summary>
00197             Gla,
00198             /// <summary>
00199             /// The Irish language.
00200             /// </summary>
00201             Gle,
00202             /// <summary>
00203             /// The Galician language.
00204             /// </summary>
00205             Glg,
00206             /// <summary>
00207             /// The Greek, Ancient (to 1453) language.
00208             /// </summary>
00209             Grc,
00210             /// <summary>
00211             /// The Gujarati language.
00212             /// </summary>
00213             Guj,
00214             /// <summary>
00215             /// The Haitian/Haitian Creole language.
00216             /// </summary>
00217             Hat,
00218             /// <summary>
00219             /// The Hebrew language.
00220             /// </summary>
00221             Heb,
00222             /// <summary>
00223             /// The Hindi language.
00224             /// </summary>
00225             Hin,
00226             /// <summary>
00227             /// The Croatian language.
```

```
00228             /// </summary>
00229             Hrv,
00230             /// <summary>
00231             /// The Hungarian language.
00232             /// </summary>
00233             Hun,
00234             /// <summary>
00235             /// The Armenian language.
00236             /// </summary>
00237             Hye,
00238             /// <summary>
00239             /// The Inuktitut language.
00240             /// </summary>
00241             Iku,
00242             /// <summary>
00243             /// The Indonesian language.
00244             /// </summary>
00245             Ind,
00246             /// <summary>
00247             /// The Icelandic language.
00248             /// </summary>
00249             Isl,
00250             /// <summary>
00251             /// The Italian language.
00252             /// </summary>
00253             Ita,
00254             /// <summary>
00255             /// The Italian language (old).
00256             /// </summary>
00257             Ita_Old,
00258             /// <summary>
00259             /// The Javanese language.
00260             /// </summary>
00261             Jav,
00262             /// <summary>
00263             /// The Japanese language.
00264             /// </summary>
00265             Jpn,
00266             /// <summary>
00267             /// The Japanese language (vertical).
00268             /// </summary>
00269             Jpn_Vert,
00270             /// <summary>
00271             /// The Kannada language.
00272             /// </summary>
00273             Kan,
00274             /// <summary>
00275             /// The Georgian language.
00276             /// </summary>
00277             Kat,
00278             /// <summary>
00279             /// The Georgian language (old).
00280             /// </summary>
00281             Kat_Old,
00282             /// <summary>
00283             /// The Kazakh language.
00284             /// </summary>
00285             Kaz,
00286             /// <summary>
00287             /// The Central Khmer language.
00288             /// </summary>
00289             Khm,
00290             /// <summary>
00291             /// The Kirghiz/Kyrgyz language.
00292             /// </summary>
00293             Kir,
00294             /// <summary>
00295             /// The Northern Kurdish language.
00296             /// </summary>
00297             Kmr,
00298             /// <summary>
00299             /// The Korean language.
00300             /// </summary>
00301             Kor,
00302             /// <summary>
00303             /// The Korean language (vertical).
00304             /// </summary>
00305             Kor_Vert,
00306             /// <summary>
00307             /// The Lao language.
00308             /// </summary>
00309             Lao,
00310             /// <summary>
00311             /// The Latin language.
00312             /// </summary>
00313             Lat,
00314             /// <summary>
```

```
00315             /// The Latvian language.
00316             /// </summary>
00317             Lav,
00318             /// <summary>
00319             /// The Lithuanian language.
00320             /// </summary>
00321             Lit,
00322             /// <summary>
00323             /// The Luxembourgish/Letzeburgesch language.
00324             /// </summary>
00325             Ltz,
00326             /// <summary>
00327             /// The Malayalam language.
00328             /// </summary>
00329             Mal,
00330             /// <summary>
00331             /// The Marathi language.
00332             /// </summary>
00333             Mar,
00334             /// <summary>
00335             /// The Macedonian language.
00336             /// </summary>
00337             Mkd,
00338             /// <summary>
00339             /// The Maltese language.
00340             /// </summary>
00341             Mlt,
00342             /// <summary>
00343             /// The Mongolian language.
00344             /// </summary>
00345             Mon,
00346             /// <summary>
00347             /// The Maori language.
00348             /// </summary>
00349             Mri,
00350             /// <summary>
00351             /// The Malay language.
00352             /// </summary>
00353             Msa,
00354             /// <summary>
00355             /// The Burmese language.
00356             /// </summary>
00357             Mya,
00358             /// <summary>
00359             /// The Nepali language.
00360             /// </summary>
00361             Nep,
00362             /// <summary>
00363             /// The Dutch/Flemish language.
00364             /// </summary>
00365             Nld,
00366             /// <summary>
00367             /// The Norwegian language.
00368             /// </summary>
00369             Nor,
00370             /// <summary>
00371             /// The Occitan (post 1500) language.
00372             /// </summary>
00373             Oci,
00374             /// <summary>
00375             /// The Oriya language.
00376             /// </summary>
00377             Ori,
00378             /// <summary>
00379             /// The Orientation and script detection module.
00380             /// </summary>
00381             Osd,
00382             /// <summary>
00383             /// The Panjabi/Punjabi language.
00384             /// </summary>
00385             Pan,
00386             /// <summary>
00387             /// The Polish language.
00388             /// </summary>
00389             Pol,
00390             /// <summary>
00391             /// The Portuguese language.
00392             /// </summary>
00393             Por,
00394             /// <summary>
00395             /// The Pushto/Pashto language.
00396             /// </summary>
00397             Pus,
00398             /// <summary>
00399             /// The Quechua language.
00400             /// </summary>
00401             Que,
```

```
00402             /// <summary>
00403             /// The Romanian/Moldavian/Moldovan language.
00404             /// </summary>
00405             Ron,
00406             /// <summary>
00407             /// The Russian language.
00408             /// </summary>
00409             Rus,
00410             /// <summary>
00411             /// The Sanskrit language.
00412             /// </summary>
00413             San,
00414             /// <summary>
00415             /// The Sinhala/Sinhalese language.
00416             /// </summary>
00417             Sin,
00418             /// <summary>
00419             /// The Slovak language.
00420             /// </summary>
00421             Slk,
00422             /// <summary>
00423             /// The Slovenian language.
00424             /// </summary>
00425             Slv,
00426             /// <summary>
00427             /// The Sindhi language.
00428             /// </summary>
00429             Snd,
00430             /// <summary>
00431             /// The Spanish/Castilian language.
00432             /// </summary>
00433             Spa,
00434             /// <summary>
00435             /// The Spanish/Castilian language (old).
00436             /// </summary>
00437             Spa_Old,
00438             /// <summary>
00439             /// The Albanian language.
00440             /// </summary>
00441             Sqi,
00442             /// <summary>
00443             /// The Serbian language.
00444             /// </summary>
00445             Srp,
00446             /// <summary>
00447             /// The Serbian language (Latin).
00448             /// </summary>
00449             Srp_Latn,
00450             /// <summary>
00451             /// The Sundanese language.
00452             /// </summary>
00453             Sun,
00454             /// <summary>
00455             /// The Swahili language.
00456             /// </summary>
00457             Swa,
00458             /// <summary>
00459             /// The Swedish language.
00460             /// </summary>
00461             Swe,
00462             /// <summary>
00463             /// The Syriac language.
00464             /// </summary>
00465             Syr,
00466             /// <summary>
00467             /// The Tamil language.
00468             /// </summary>
00469             Tam,
00470             /// <summary>
00471             /// The Tatar language.
00472             /// </summary>
00473             Tat,
00474             /// <summary>
00475             /// The Telugu language.
00476             /// </summary>
00477             Tel,
00478             /// <summary>
00479             /// The Tajik language.
00480             /// </summary>
00481             Tgk,
00482             /// <summary>
00483             /// The Thai language.
00484             /// </summary>
00485             Tha,
00486             /// <summary>
00487             /// The Tigrinya language.
00488             /// </summary>
```

```
00489             Tir,
00490             /// <summary>
00491             /// The Tonga (Tonga Islands) language.
00492             /// </summary>
00493             Ton,
00494             /// <summary>
00495             /// The Turkish language.
00496             /// </summary>
00497             Tur,
00498             /// <summary>
00499             /// The Uighur/Uyghur language.
00500             /// </summary>
00501             Uig,
00502             /// <summary>
00503             /// The Ukrainian language.
00504             /// </summary>
00505             Ukr,
00506             /// <summary>
00507             /// The Urdu language.
00508             /// </summary>
00509             Urd,
00510             /// <summary>
00511             /// The Uzbek language.
00512             /// </summary>
00513             Uzb,
00514             /// <summary>
00515             /// The Uzbek language (Cyrillic).
00516             /// </summary>
00517             Uzb_Cyrl,
00518             /// <summary>
00519             /// The Vietnamese language.
00520             /// </summary>
00521             Vie,
00522             /// <summary>
00523             /// The Yiddish language.
00524             /// </summary>
00525             Yid,
00526             /// <summary>
00527             /// The Yoruba language.
00528             /// </summary>
00529             Yor
00530         }
00531
00532         /// <summary>
00533         /// Fast integer versions of trained models. These are models for a single script supporting
      one or more languages.
00534         /// </summary>
00535         public enum FastScripts
00536         {
00537             /// <summary>
00538             /// The Arabic script.
00539             /// </summary>
00540             Arabic,
00541             /// <summary>
00542             /// The Armenian script.
00543             /// </summary>
00544             Armenian,
00545             /// <summary>
00546             /// The Bengali script.
00547             /// </summary>
00548             Bengali,
00549             /// <summary>
00550             /// The Canadian Aboriginal script.
00551             /// </summary>
00552             Canadian_Aboriginal,
00553             /// <summary>
00554             /// The Cherokee script.
00555             /// </summary>
00556             Cherokee,
00557             /// <summary>
00558             /// The Cyrillic script.
00559             /// </summary>
00560             Cyrillic,
00561             /// <summary>
00562             /// The Devanagari script.
00563             /// </summary>
00564             Devanagari,
00565             /// <summary>
00566             /// The Ethiopic script.
00567             /// </summary>
00568             Ethiopic,
00569             /// <summary>
00570             /// The Fraktur script.
00571             /// </summary>
00572             Fraktur,
00573             /// <summary>
00574             /// The Georgian script.
```

```
00575             /// </summary>
00576             Georgian,
00577             /// <summary>
00578             /// The Greek script.
00579             /// </summary>
00580             Greek,
00581             /// <summary>
00582             /// The Gujarati script.
00583             /// </summary>
00584             Gujarati,
00585             /// <summary>
00586             /// The Gurmukhi script.
00587             /// </summary>
00588             Gurmukhi,
00589             /// <summary>
00590             /// The Han (Simplified) script.
00591             /// </summary>
00592             HanS,
00593             /// <summary>
00594             /// The Han (Simplified) script. (vertical)
00595             /// </summary>
00596             HanS_Vert,
00597             /// <summary>
00598             /// The Han (Traditional) script.
00599             /// </summary>
00600             HanT,
00601             /// <summary>
00602             /// The Han (Traditional) script. (vertical)
00603             /// </summary>
00604             HanT_Vert,
00605             /// <summary>
00606             /// The Hangul script.
00607             /// </summary>
00608             Hangul,
00609             /// <summary>
00610             /// The Hangul script. (vertical)
00611             /// </summary>
00612             Hangul_Vert,
00613             /// <summary>
00614             /// The Hebrew script.
00615             /// </summary>
00616             Hebrew,
00617             /// <summary>
00618             /// The Japanese script.
00619             /// </summary>
00620             Japanese,
00621             /// <summary>
00622             /// The Japanese script. (vertical)
00623             /// </summary>
00624             Japanese_Vert,
00625             /// <summary>
00626             /// The Kannada script.
00627             /// </summary>
00628             Kannada,
00629             /// <summary>
00630             /// The Khmer script.
00631             /// </summary>
00632             Khmer,
00633             /// <summary>
00634             /// The Lao script.
00635             /// </summary>
00636             Lao,
00637             /// <summary>
00638             /// The Latin script.
00639             /// </summary>
00640             Latin,
00641             /// <summary>
00642             /// The Malayalam script.
00643             /// </summary>
00644             Malayalam,
00645             /// <summary>
00646             /// The Myanmar script.
00647             /// </summary>
00648             Myanmar,
00649             /// <summary>
00650             /// The Oriya script.
00651             /// </summary>
00652             Oriya,
00653             /// <summary>
00654             /// The Sinhala script.
00655             /// </summary>
00656             Sinhala,
00657             /// <summary>
00658             /// The Syriac script.
00659             /// </summary>
00660             Syriac,
00661             /// <summary>
```

```
00662             /// The Tamil script.
00663             /// </summary>
00664             Tamil,
00665             /// <summary>
00666             /// The Telugu script.
00667             /// </summary>
00668             Telugu,
00669             /// <summary>
00670             /// The Thaana script.
00671             /// </summary>
00672             Thaana,
00673             /// <summary>
00674             /// The Thai script.
00675             /// </summary>
00676             Thai,
00677             /// <summary>
00678             /// The Tibetan script.
00679             /// </summary>
00680             Tibetan,
00681             /// <summary>
00682             /// The Vietnamese script.
00683             /// </summary>
00684             Vietnamese
00685         }
00686
00687         /// <summary>
00688         /// Best (most accurate) trained models. These are models for a single language.
00689         /// </summary>
00690         public enum Best
00691         {
00692             /// <summary>
00693             /// The Afrikaans language.
00694             /// </summary>
00695             Afr,
00696             /// <summary>
00697             /// The Amharic language.
00698             /// </summary>
00699             Amh,
00700             /// <summary>
00701             /// The Arabic language.
00702             /// </summary>
00703             Ara,
00704             /// <summary>
00705             /// The Assamese language.
00706             /// </summary>
00707             Asm,
00708             /// <summary>
00709             /// The Azerbaijani language.
00710             /// </summary>
00711             Aze,
00712             /// <summary>
00713             /// The Azerbaijani language (Cyrillic).
00714             /// </summary>
00715             Aze_Cyrl,
00716             /// <summary>
00717             /// The Belarusian language.
00718             /// </summary>
00719             Bel,
00720             /// <summary>
00721             /// The Bengali language.
00722             /// </summary>
00723             Ben,
00724             /// <summary>
00725             /// The Tibetan language.
00726             /// </summary>
00727             Bod,
00728             /// <summary>
00729             /// The Bosnian language.
00730             /// </summary>
00731             Bos,
00732             /// <summary>
00733             /// The Breton language.
00734             /// </summary>
00735             Bre,
00736             /// <summary>
00737             /// The Bulgarian language.
00738             /// </summary>
00739             Bul,
00740             /// <summary>
00741             /// The Catalan/Valencian language.
00742             /// </summary>
00743             Cat,
00744             /// <summary>
00745             /// The Cebuano language.
00746             /// </summary>
00747             Ceb,
00748             /// <summary>
```

```
00749             /// The Czech language.
00750             /// </summary>
00751             Ces,
00752             /// <summary>
00753             /// The Chinese (Simplified) language.
00754             /// </summary>
00755             Chi_Sim,
00756             /// <summary>
00757             /// The Chinese (Simplified) language (vertical).
00758             /// </summary>
00759             Chi_Sim_Vert,
00760             /// <summary>
00761             /// The Chinese (Traditional) language.
00762             /// </summary>
00763             Chi_Tra,
00764             /// <summary>
00765             /// The Chinese (Traditional) language (vertical).
00766             /// </summary>
00767             Chi_Tra_Vert,
00768             /// <summary>
00769             /// The Cherokee language.
00770             /// </summary>
00771             Chr,
00772             /// <summary>
00773             /// The Corsican language.
00774             /// </summary>
00775             Cos,
00776             /// <summary>
00777             /// The Welsh language.
00778             /// </summary>
00779             Cym,
00780             /// <summary>
00781             /// The Danish language.
00782             /// </summary>
00783             Dan,
00784             /// <summary>
00785             /// The German language.
00786             /// </summary>
00787             Deu,
00788             /// <summary>
00789             /// The Divehi/Dhivehi/Maldivian language.
00790             /// </summary>
00791             Div,
00792             /// <summary>
00793             /// The Dzongkha language.
00794             /// </summary>
00795             Dzo,
00796             /// <summary>
00797             /// The Greek, Modern (1453-) language.
00798             /// </summary>
00799             Ell,
00800             /// <summary>
00801             /// The English language.
00802             /// </summary>
00803             Eng,
00804             /// <summary>
00805             /// The English, Middle (1100-1500) language.
00806             /// </summary>
00807             Enm,
00808             /// <summary>
00809             /// The Esperanto language.
00810             /// </summary>
00811             Epo,
00812             /// <summary>
00813             /// The Estonian language.
00814             /// </summary>
00815             Est,
00816             /// <summary>
00817             /// The Basque language.
00818             /// </summary>
00819             Eus,
00820             /// <summary>
00821             /// The Faroese language.
00822             /// </summary>
00823             Fao,
00824             /// <summary>
00825             /// The Persian language.
00826             /// </summary>
00827             Fas,
00828             /// <summary>
00829             /// The Filipino/Pilipino language.
00830             /// </summary>
00831             Fil,
00832             /// <summary>
00833             /// The Finnish language.
00834             /// </summary>
00835             Fin,
```

```
00836             /// <summary>
00837             /// The French language.
00838             /// </summary>
00839             Fra,
00840             /// <summary>
00841             /// The German - Fraktur language.
00842             /// </summary>
00843             Frk,
00844             /// <summary>
00845             /// The French, Middle (ca.1400-1600) language.
00846             /// </summary>
00847             Frm,
00848             /// <summary>
00849             /// The Western Frisian language.
00850             /// </summary>
00851             Fry,
00852             /// <summary>
00853             /// The Gaelic/Scottish Gaelic language.
00854             /// </summary>
00855             Gla,
00856             /// <summary>
00857             /// The Irish language.
00858             /// </summary>
00859             Gle,
00860             /// <summary>
00861             /// The Galician language.
00862             /// </summary>
00863             Glg,
00864             /// <summary>
00865             /// The Greek, Ancient (to 1453) language.
00866             /// </summary>
00867             Grc,
00868             /// <summary>
00869             /// The Gujarati language.
00870             /// </summary>
00871             Guj,
00872             /// <summary>
00873             /// The Haitian/Haitian Creole language.
00874             /// </summary>
00875             Hat,
00876             /// <summary>
00877             /// The Hebrew language.
00878             /// </summary>
00879             Heb,
00880             /// <summary>
00881             /// The Hindi language.
00882             /// </summary>
00883             Hin,
00884             /// <summary>
00885             /// The Croatian language.
00886             /// </summary>
00887             Hrv,
00888             /// <summary>
00889             /// The Hungarian language.
00890             /// </summary>
00891             Hun,
00892             /// <summary>
00893             /// The Armenian language.
00894             /// </summary>
00895             Hye,
00896             /// <summary>
00897             /// The Inuktitut language.
00898             /// </summary>
00899             Iku,
00900             /// <summary>
00901             /// The Indonesian language.
00902             /// </summary>
00903             Ind,
00904             /// <summary>
00905             /// The Icelandic language.
00906             /// </summary>
00907             Isl,
00908             /// <summary>
00909             /// The Italian language.
00910             /// </summary>
00911             Ita,
00912             /// <summary>
00913             /// The Italian language (old).
00914             /// </summary>
00915             Ita_Old,
00916             /// <summary>
00917             /// The Javanese language.
00918             /// </summary>
00919             Jav,
00920             /// <summary>
00921             /// The Japanese language.
00922             /// </summary>
```

```
00923             Jpn,
00924             /// <summary>
00925             /// The Japanese language (vertical).
00926             /// </summary>
00927             Jpn_Vert,
00928             /// <summary>
00929             /// The Kannada language.
00930             /// </summary>
00931             Kan,
00932             /// <summary>
00933             /// The Georgian language.
00934             /// </summary>
00935             Kat,
00936             /// <summary>
00937             /// The Georgian language (old).
00938             /// </summary>
00939             Kat_Old,
00940             /// <summary>
00941             /// The Kazakh language.
00942             /// </summary>
00943             Kaz,
00944             /// <summary>
00945             /// The Central Khmer language.
00946             /// </summary>
00947             Khm,
00948             /// <summary>
00949             /// The Kirghiz/Kyrgyz language.
00950             /// </summary>
00951             Kir,
00952             /// <summary>
00953             /// The Northern Kurdish language.
00954             /// </summary>
00955             Kmr,
00956             /// <summary>
00957             /// The Korean language.
00958             /// </summary>
00959             Kor,
00960             /// <summary>
00961             /// The Korean language (vertical).
00962             /// </summary>
00963             Kor_Vert,
00964             /// <summary>
00965             /// The Lao language.
00966             /// </summary>
00967             Lao,
00968             /// <summary>
00969             /// The Latin language.
00970             /// </summary>
00971             Lat,
00972             /// <summary>
00973             /// The Latvian language.
00974             /// </summary>
00975             Lav,
00976             /// <summary>
00977             /// The Lithuanian language.
00978             /// </summary>
00979             Lit,
00980             /// <summary>
00981             /// The Luxembourgish/Letzeburgesch language.
00982             /// </summary>
00983             Ltz,
00984             /// <summary>
00985             /// The Malayalam language.
00986             /// </summary>
00987             Mal,
00988             /// <summary>
00989             /// The Marathi language.
00990             /// </summary>
00991             Mar,
00992             /// <summary>
00993             /// The Macedonian language.
00994             /// </summary>
00995             Mkd,
00996             /// <summary>
00997             /// The Maltese language.
00998             /// </summary>
00999             Mlt,
01000             /// <summary>
01001             /// The Mongolian language.
01002             /// </summary>
01003             Mon,
01004             /// <summary>
01005             /// The Maori language.
01006             /// </summary>
01007             Mri,
01008             /// <summary>
01009             /// The Malay language.
```

```
01010             /// </summary>
01011             Msa,
01012             /// <summary>
01013             /// The Burmese language.
01014             /// </summary>
01015             Mya,
01016             /// <summary>
01017             /// The Nepali language.
01018             /// </summary>
01019             Nep,
01020             /// <summary>
01021             /// The Dutch/Flemish language.
01022             /// </summary>
01023             Nld,
01024             /// <summary>
01025             /// The Norwegian language.
01026             /// </summary>
01027             Nor,
01028             /// <summary>
01029             /// The Occitan (post 1500) language.
01030             /// </summary>
01031             Oci,
01032             /// <summary>
01033             /// The Oriya language.
01034             /// </summary>
01035             Ori,
01036             /// <summary>
01037             /// The Orientation and script detection module.
01038             /// </summary>
01039             Osd,
01040             /// <summary>
01041             /// The Panjabi/Punjabi language.
01042             /// </summary>
01043             Pan,
01044             /// <summary>
01045             /// The Polish language.
01046             /// </summary>
01047             Pol,
01048             /// <summary>
01049             /// The Portuguese language.
01050             /// </summary>
01051             Por,
01052             /// <summary>
01053             /// The Pushto/Pashto language.
01054             /// </summary>
01055             Pus,
01056             /// <summary>
01057             /// The Quechua language.
01058             /// </summary>
01059             Que,
01060             /// <summary>
01061             /// The Romanian/Moldavian/Moldovan language.
01062             /// </summary>
01063             Ron,
01064             /// <summary>
01065             /// The Russian language.
01066             /// </summary>
01067             Rus,
01068             /// <summary>
01069             /// The Sanskrit language.
01070             /// </summary>
01071             San,
01072             /// <summary>
01073             /// The Sinhala/Sinhalese language.
01074             /// </summary>
01075             Sin,
01076             /// <summary>
01077             /// The Slovak language.
01078             /// </summary>
01079             Slk,
01080             /// <summary>
01081             /// The Slovenian language.
01082             /// </summary>
01083             Slv,
01084             /// <summary>
01085             /// The Sindhi language.
01086             /// </summary>
01087             Snd,
01088             /// <summary>
01089             /// The Spanish/Castilian language.
01090             /// </summary>
01091             Spa,
01092             /// <summary>
01093             /// The Spanish/Castilian language (old).
01094             /// </summary>
01095             Spa_Old,
01096             /// <summary>
```

```
01097             /// The Albanian language.
01098             /// </summary>
01099             Sqi,
01100             /// <summary>
01101             /// The Serbian language.
01102             /// </summary>
01103             Srp,
01104             /// <summary>
01105             /// The Serbian language (Latin).
01106             /// </summary>
01107             Srp_Latn,
01108             /// <summary>
01109             /// The Sundanese language.
01110             /// </summary>
01111             Sun,
01112             /// <summary>
01113             /// The Swahili language.
01114             /// </summary>
01115             Swa,
01116             /// <summary>
01117             /// The Swedish language.
01118             /// </summary>
01119             Swe,
01120             /// <summary>
01121             /// The Syriac language.
01122             /// </summary>
01123             Syr,
01124             /// <summary>
01125             /// The Tamil language.
01126             /// </summary>
01127             Tam,
01128             /// <summary>
01129             /// The Tatar language.
01130             /// </summary>
01131             Tat,
01132             /// <summary>
01133             /// The Telugu language.
01134             /// </summary>
01135             Tel,
01136             /// <summary>
01137             /// The Tajik language.
01138             /// </summary>
01139             Tgk,
01140             /// <summary>
01141             /// The Thai language.
01142             /// </summary>
01143             Tha,
01144             /// <summary>
01145             /// The Tigrinya language.
01146             /// </summary>
01147             Tir,
01148             /// <summary>
01149             /// The Tonga (Tonga Islands) language.
01150             /// </summary>
01151             Ton,
01152             /// <summary>
01153             /// The Turkish language.
01154             /// </summary>
01155             Tur,
01156             /// <summary>
01157             /// The Uighur/Uyghur language.
01158             /// </summary>
01159             Uig,
01160             /// <summary>
01161             /// The Ukrainian language.
01162             /// </summary>
01163             Ukr,
01164             /// <summary>
01165             /// The Urdu language.
01166             /// </summary>
01167             Urd,
01168             /// <summary>
01169             /// The Uzbek language.
01170             /// </summary>
01171             Uzb,
01172             /// <summary>
01173             /// The Uzbek language (Cyrillic).
01174             /// </summary>
01175             Uzb_Cyrl,
01176             /// <summary>
01177             /// The Vietnamese language.
01178             /// </summary>
01179             Vie,
01180             /// <summary>
01181             /// The Yiddish language.
01182             /// </summary>
01183             Yid,
```

```
01184             /// <summary>
01185             /// The Yoruba language.
01186             /// </summary>
01187             Yor
01188         }
01189 
01190         /// <summary>
01191         /// Best (most accurate) trained models. These are models for a single script supporting one
      or more languages.
01192         /// </summary>
01193         public enum BestScripts
01194         {
01195             /// <summary>
01196             /// The Arabic script.
01197             /// </summary>
01198             Arabic,
01199             /// <summary>
01200             /// The Armenian script.
01201             /// </summary>
01202             Armenian,
01203             /// <summary>
01204             /// The Bengali script.
01205             /// </summary>
01206             Bengali,
01207             /// <summary>
01208             /// The Canadian Aboriginal script.
01209             /// </summary>
01210             Canadian_Aboriginal,
01211             /// <summary>
01212             /// The Cherokee script.
01213             /// </summary>
01214             Cherokee,
01215             /// <summary>
01216             /// The Cyrillic script.
01217             /// </summary>
01218             Cyrillic,
01219             /// <summary>
01220             /// The Devanagari script.
01221             /// </summary>
01222             Devanagari,
01223             /// <summary>
01224             /// The Ethiopic script.
01225             /// </summary>
01226             Ethiopic,
01227             /// <summary>
01228             /// The Fraktur script.
01229             /// </summary>
01230             Fraktur,
01231             /// <summary>
01232             /// The Georgian script.
01233             /// </summary>
01234             Georgian,
01235             /// <summary>
01236             /// The Greek script.
01237             /// </summary>
01238             Greek,
01239             /// <summary>
01240             /// The Gujarati script.
01241             /// </summary>
01242             Gujarati,
01243             /// <summary>
01244             /// The Gurmukhi script.
01245             /// </summary>
01246             Gurmukhi,
01247             /// <summary>
01248             /// The Han (Simplified) script.
01249             /// </summary>
01250             HanS,
01251             /// <summary>
01252             /// The Han (Simplified) script. (vertical)
01253             /// </summary>
01254             HanS_Vert,
01255             /// <summary>
01256             /// The Han (Traditional) script.
01257             /// </summary>
01258             HanT,
01259             /// <summary>
01260             /// The Han (Traditional) script. (vertical)
01261             /// </summary>
01262             HanT_Vert,
01263             /// <summary>
01264             /// The Hangul script.
01265             /// </summary>
01266             Hangul,
01267             /// <summary>
01268             /// The Hangul script. (vertical)
01269             /// </summary>
```

```
01270            Hangul_Vert,
01271            /// <summary>
01272            /// The Hebrew script.
01273            /// </summary>
01274            Hebrew,
01275            /// <summary>
01276            /// The Japanese script.
01277            /// </summary>
01278            Japanese,
01279            /// <summary>
01280            /// The Japanese script. (vertical)
01281            /// </summary>
01282            Japanese_Vert,
01283            /// <summary>
01284            /// The Kannada script.
01285            /// </summary>
01286            Kannada,
01287            /// <summary>
01288            /// The Khmer script.
01289            /// </summary>
01290            Khmer,
01291            /// <summary>
01292            /// The Lao script.
01293            /// </summary>
01294            Lao,
01295            /// <summary>
01296            /// The Latin script.
01297            /// </summary>
01298            Latin,
01299            /// <summary>
01300            /// The Malayalam script.
01301            /// </summary>
01302            Malayalam,
01303            /// <summary>
01304            /// The Myanmar script.
01305            /// </summary>
01306            Myanmar,
01307            /// <summary>
01308            /// The Oriya script.
01309            /// </summary>
01310            Oriya,
01311            /// <summary>
01312            /// The Sinhala script.
01313            /// </summary>
01314            Sinhala,
01315            /// <summary>
01316            /// The Syriac script.
01317            /// </summary>
01318            Syriac,
01319            /// <summary>
01320            /// The Tamil script.
01321            /// </summary>
01322            Tamil,
01323            /// <summary>
01324            /// The Telugu script.
01325            /// </summary>
01326            Telugu,
01327            /// <summary>
01328            /// The Thaana script.
01329            /// </summary>
01330            Thaana,
01331            /// <summary>
01332            /// The Thai script.
01333            /// </summary>
01334            Thai,
01335            /// <summary>
01336            /// The Tibetan script.
01337            /// </summary>
01338            Tibetan,
01339            /// <summary>
01340            /// The Vietnamese script.
01341            /// </summary>
01342            Vietnamese
01343        }
01344
01345        /// <summary>
01346        /// Create a new <see cref="TesseractLanguage"/> object using the provided <paramref
         name="prefix"/> and <paramref name="language"/> name, without processing them in any way.
01347        /// </summary>
01348        /// <param name="prefix">The name of the folder where the language file is located. If this is
         <see langword="null" />, the value of the environment variable <c>TESSDATA_PREFIX</c> will be
         used.</param>
01349        /// <param name="language">The name of the language. The Tesseract library will assume that
         the trained language data file can be found at <paramref name="prefix"/><c>/</c><paramref
         name="language"/><c>.traineddata</c>.</param>
01350        public TesseractLanguage(string prefix, string language)
01351        {
```

```
01352             this.Prefix = prefix;
01353             this.Language = language;
01354         }
01355 
01356         /// <summary>
01357         /// Create a new <see cref="TesseractLanguage"/> object using the specified trained model data
      file.
01358         /// </summary>
01359         /// <param name="fileName">The path to the trained model data file. If the file name does not
      end in <c>.traineddata</c>, the file is copied to a temporary folder, and the temporary file is used
      by the Tesseract library.</param>
01360         public TesseractLanguage(string fileName)
01361         {
01362             if (fileName.EndsWith(".traineddata"))
01363             {
01364                 fileName = Path.GetFullPath(fileName);
01365 
01366                 this.Prefix = Path.GetDirectoryName(fileName);
01367                 this.Language = Path.GetFileName(fileName).Substring(0,
      Path.GetFileName(fileName).Length - 12);
01368             }
01369             else
01370             {
01371                 this.Prefix = Path.GetTempPath();
01372                 this.Language = Guid.NewGuid().ToString("N");
01373 
01374                 File.Copy(fileName, Path.Combine(this.Prefix, this.Language + ".traineddata"));
01375             }
01376 
01377         }
01378 
01379         private static readonly string ExecutablePath =
      Path.GetDirectoryName(Assembly.GetEntryAssembly().Location);
01380         private static readonly string LocalCachePath =
      Environment.GetFolderPath(Environment.SpecialFolder.LocalApplicationData);
01381 
01382         /// <summary>
01383         /// Create a new <see cref="TesseractLanguage"/> object using a fast integer version of a
      trained model for the specified language. The language file is downloaded from the
      <c>tesseract-ocr/tessdata_fast</c> GitHub repository. If it has already been downloaded and cached
      before, the downloaded file is re-used.
01384         /// </summary>
01385         /// <param name="language">The language to use for the OCR process.</param>
01386         /// <param name="useAnyCached">If this is <see langword="true"/>, if a cached trained model
      file is available for the specified language, it will be used even if it is a "best (most accurate)"
      model. Otherwise, only cached fast integer trained models will be used.</param>
01387         public TesseractLanguage(Fast language, bool useAnyCached = false)
01388         {
01389             string languageName = language.ToString().ToLower();
01390 
01391             string prefix = null;
01392 
01393             if (!string.IsNullOrEmpty(ExecutablePath) && File.Exists(Path.Combine(ExecutablePath,
      "tessdata", "fast", languageName + ".traineddata")))
01394             {
01395                 prefix = Path.Combine(ExecutablePath, "tessdata", "fast");
01396             }
01397             else if (!string.IsNullOrEmpty(ExecutablePath) && File.Exists(Path.Combine(ExecutablePath,
      "fast", languageName + ".traineddata")))
01398             {
01399                 prefix = Path.Combine(ExecutablePath, "fast");
01400             }
01401             else if (File.Exists(Path.Combine(LocalCachePath, "tessdata", "fast", languageName +
      ".traineddata")))
01402             {
01403                 prefix = Path.Combine(LocalCachePath, "tessdata", "fast");
01404             }
01405             else if (useAnyCached)
01406             {
01407                 if (!string.IsNullOrEmpty(ExecutablePath) && File.Exists(Path.Combine(ExecutablePath,
      languageName + ".traineddata")))
01408                 {
01409                     prefix = Path.Combine(ExecutablePath);
01410                 }
01411                 else if (!string.IsNullOrEmpty(ExecutablePath) &&
      File.Exists(Path.Combine(ExecutablePath, "tessdata", "best", languageName + ".traineddata")))
01412                 {
01413                     prefix = Path.Combine(ExecutablePath, "tessdata", "best");
01414                 }
01415                 else if (!string.IsNullOrEmpty(ExecutablePath) &&
      File.Exists(Path.Combine(ExecutablePath, "best", languageName + ".traineddata")))
01416                 {
01417                     prefix = Path.Combine(ExecutablePath, "best");
01418                 }
01419                 else if (File.Exists(Path.Combine(LocalCachePath, "tessdata", "best", languageName +
      ".traineddata")))
01420                 {
```

```
01421                   prefix = Path.Combine(LocalCachePath, "tessdata", "best");
01422               }
01423           }
01424
01425           if (prefix == null)
01426           {
01427               string remotePath = "https://github.com/tesseract-ocr/tessdata_fast/raw/main/" +
      languageName + ".traineddata";
01428
01429               string localDirectory = Path.Combine(LocalCachePath, "tessdata", "fast");
01430
01431               if (!Directory.Exists(localDirectory))
01432               {
01433                   Directory.CreateDirectory(localDirectory);
01434               }
01435
01436               using (WebClient client = new WebClient())
01437               {
01438                   client.DownloadFile(remotePath, Path.Combine(localDirectory, languageName +
      ".traineddata"));
01439               }
01440
01441               prefix = localDirectory;
01442           }
01443
01444           this.Prefix = prefix;
01445           this.Language = languageName;
01446       }
01447
01448       /// <summary>
01449       /// Create a new <see cref="TesseractLanguage"/> object using the best (most accurate) version
      of the trained model for the specified language. The language file is downloaded from the
      <c>tesseract-ocr/tessdata_best</c> GitHub repository. If it has already been downloaded and cached
      before, the downloaded file is re-used.
01450       /// </summary>
01451       /// <param name="language">The language to use for the OCR process.</param>
01452       /// <param name="useAnyCached">If this is <see langword="true"/>, if a cached trained model
      file is available for the specified language, it will be used even if it is a "fast" model.
      Otherwise, only cached best (most accurate) trained models will be used.</param>
01453       public TesseractLanguage(Best language, bool useAnyCached = false)
01454       {
01455           string languageName = language.ToString().ToLower();
01456
01457           string prefix = null;
01458
01459           if (!string.IsNullOrEmpty(ExecutablePath) && File.Exists(Path.Combine(ExecutablePath,
      "tessdata", "best", languageName + ".traineddata")))
01460           {
01461               prefix = Path.Combine(ExecutablePath, "tessdata", "best");
01462           }
01463           else if (!string.IsNullOrEmpty(ExecutablePath) && File.Exists(Path.Combine(ExecutablePath,
      "best", languageName + ".traineddata")))
01464           {
01465               prefix = Path.Combine(ExecutablePath, "best");
01466           }
01467           else if (File.Exists(Path.Combine(LocalCachePath, "tessdata", "best", languageName +
      ".traineddata")))
01468           {
01469               prefix = Path.Combine(LocalCachePath, "tessdata", "best");
01470           }
01471           else if (useAnyCached)
01472           {
01473               if (!string.IsNullOrEmpty(ExecutablePath) && File.Exists(Path.Combine(ExecutablePath,
      languageName + ".traineddata")))
01474               {
01475                   prefix = Path.Combine(ExecutablePath);
01476               }
01477               else if (!string.IsNullOrEmpty(ExecutablePath) &&
      File.Exists(Path.Combine(ExecutablePath, "tessdata", "fast", languageName + ".traineddata")))
01478               {
01479                   prefix = Path.Combine(ExecutablePath, "tessdata", "fast");
01480               }
01481               else if (!string.IsNullOrEmpty(ExecutablePath) &&
      File.Exists(Path.Combine(ExecutablePath, "fast", languageName + ".traineddata")))
01482               {
01483                   prefix = Path.Combine(ExecutablePath, "fast");
01484               }
01485               else if (File.Exists(Path.Combine(LocalCachePath, "tessdata", "fast", languageName +
      ".traineddata")))
01486               {
01487                   prefix = Path.Combine(LocalCachePath, "tessdata", "fast");
01488               }
01489           }
01490
01491           if (prefix == null)
01492           {
01493               string remotePath = "https://github.com/tesseract-ocr/tessdata_best/raw/main/" +
```

```
languageName + ".traineddata";
01494
01495                string localDirectory = Path.Combine(LocalCachePath, "tessdata", "best");
01496
01497                if (!Directory.Exists(localDirectory))
01498                {
01499                    Directory.CreateDirectory(localDirectory);
01500                }
01501
01502                using (WebClient client = new WebClient())
01503                {
01504                    client.DownloadFile(remotePath, Path.Combine(localDirectory, languageName +
".traineddata"));
01505                }
01506
01507                prefix = localDirectory;
01508            }
01509
01510            this.Prefix = prefix;
01511            this.Language = languageName;
01512        }
01513
01514        /// <summary>
01515        /// Create a new <see cref="TesseractLanguage"/> object using a fast integer version of a
trained model for the specified script. The language file is downloaded from the
<c>tesseract-ocr/tessdata_fast</c> GitHub repository. If it has already been downloaded and cached
before, the downloaded file is re-used.
01516        /// </summary>
01517        /// <param name="script">The script to use for the OCR process.</param>
01518        /// <param name="useAnyCached">If this is <see langword="true"/>, if a cached trained model
file is available for the specified script, it will be used even if it is a "best (most accurate)"
model. Otherwise, only cached fast integer trained models will be used.</param>
01519        public TesseractLanguage(FastScripts script, bool useAnyCached = false)
01520        {
01521            string languageName = script.ToString().Replace("_Vert", "_vert");
01522
01523            string prefix = null;
01524
01525            if (!string.IsNullOrEmpty(ExecutablePath) && File.Exists(Path.Combine(ExecutablePath,
"tessdata", "fast", "script", languageName + ".traineddata")))
01526            {
01527                prefix = Path.Combine(ExecutablePath, "tessdata", "fast", "script");
01528            }
01529            else if (!string.IsNullOrEmpty(ExecutablePath) && File.Exists(Path.Combine(ExecutablePath,
"fast", "script", languageName + ".traineddata")))
01530            {
01531                prefix = Path.Combine(ExecutablePath, "fast", "script");
01532            }
01533            else if (File.Exists(Path.Combine(LocalCachePath, "tessdata", "fast", "script",
languageName + ".traineddata")))
01534            {
01535                prefix = Path.Combine(LocalCachePath, "tessdata", "fast", "script");
01536            }
01537            else if (useAnyCached)
01538            {
01539                if (!string.IsNullOrEmpty(ExecutablePath) && File.Exists(Path.Combine(ExecutablePath,
"script", languageName + ".traineddata")))
01540                {
01541                    prefix = Path.Combine(ExecutablePath, "script");
01542                }
01543                else if (!string.IsNullOrEmpty(ExecutablePath) &&
File.Exists(Path.Combine(ExecutablePath, languageName + ".traineddata")))
01544                {
01545                    prefix = Path.Combine(ExecutablePath);
01546                }
01547                else if (!string.IsNullOrEmpty(ExecutablePath) &&
File.Exists(Path.Combine(ExecutablePath, "tessdata", "best", "script", languageName +
".traineddata")))
01548                {
01549                    prefix = Path.Combine(ExecutablePath, "tessdata", "best", "script");
01550                }
01551                else if (!string.IsNullOrEmpty(ExecutablePath) &&
File.Exists(Path.Combine(ExecutablePath, "best", "script", languageName + ".traineddata")))
01552                {
01553                    prefix = Path.Combine(ExecutablePath, "best", "script");
01554                }
01555                else if (File.Exists(Path.Combine(LocalCachePath, "tessdata", "best", "script",
languageName + ".traineddata")))
01556                {
01557                    prefix = Path.Combine(LocalCachePath, "tessdata", "best", "script");
01558                }
01559            }
01560
01561            if (prefix == null)
01562            {
01563                string remotePath = "https://github.com/tesseract-ocr/tessdata_fast/raw/main/script/"
+ languageName + ".traineddata";
```

```
01564
01565                string localDirectory = Path.Combine(LocalCachePath, "tessdata", "fast", "script");
01566
01567                if (!Directory.Exists(localDirectory))
01568                {
01569                    Directory.CreateDirectory(localDirectory);
01570                }
01571
01572                using (WebClient client = new WebClient())
01573                {
01574                    client.DownloadFile(remotePath, Path.Combine(localDirectory, languageName +
       ".traineddata"));
01575                }
01576
01577                prefix = localDirectory;
01578            }
01579
01580            this.Prefix = prefix;
01581            this.Language = languageName;
01582        }
01583
01584        /// <summary>
01585        /// Create a new <see cref="TesseractLanguage"/> object using the best (most accurate) version
       of the trained model for the specified script. The language file is downloaded from the
       <c>tesseract-ocr/tessdata_best</c> GitHub repository. If it has already been downloaded and cached
       before, the downloaded file is re-used.
01586        /// </summary>
01587        /// <param name="script">The script to use for the OCR process.</param>
01588        /// <param name="useAnyCached">If this is <see langword="true"/>, if a cached trained model
       file is available for the specified script, it will be used even if it is a "fast" model. Otherwise,
       only cached best (most accurate) trained models will be used.</param>
01589        public TesseractLanguage(BestScripts script, bool useAnyCached = false)
01590        {
01591            string languageName = script.ToString().Replace("_Vert", "_vert");
01592
01593            string prefix = null;
01594
01595            if (!string.IsNullOrEmpty(ExecutablePath) && File.Exists(Path.Combine(ExecutablePath,
       "tessdata", "best", "script", languageName + ".traineddata")))
01596            {
01597                prefix = Path.Combine(ExecutablePath, "tessdata", "best", "script");
01598            }
01599            else if (!string.IsNullOrEmpty(ExecutablePath) && File.Exists(Path.Combine(ExecutablePath,
       "best", "script", languageName + ".traineddata")))
01600            {
01601                prefix = Path.Combine(ExecutablePath, "best", "script");
01602            }
01603            else if (File.Exists(Path.Combine(LocalCachePath, "tessdata", "best", "script",
       languageName + ".traineddata")))
01604            {
01605                prefix = Path.Combine(LocalCachePath, "tessdata", "best", "script");
01606            }
01607            else if (useAnyCached)
01608            {
01609                if (!string.IsNullOrEmpty(ExecutablePath) && File.Exists(Path.Combine(ExecutablePath,
       "script", languageName + ".traineddata")))
01610                {
01611                    prefix = Path.Combine(ExecutablePath, "script");
01612                }
01613                else if (!string.IsNullOrEmpty(ExecutablePath) &&
       File.Exists(Path.Combine(ExecutablePath, languageName + ".traineddata")))
01614                {
01615                    prefix = Path.Combine(ExecutablePath);
01616                }
01617                else if (!string.IsNullOrEmpty(ExecutablePath) &&
       File.Exists(Path.Combine(ExecutablePath, "tessdata", "fast", "script", languageName +
       ".traineddata")))
01618                {
01619                    prefix = Path.Combine(ExecutablePath, "tessdata", "fast", "script");
01620                }
01621                else if (!string.IsNullOrEmpty(ExecutablePath) &&
       File.Exists(Path.Combine(ExecutablePath, "fast", "script", languageName + ".traineddata")))
01622                {
01623                    prefix = Path.Combine(ExecutablePath, "fast", "script");
01624                }
01625                else if (File.Exists(Path.Combine(LocalCachePath, "tessdata", "fast", "script",
       languageName + ".traineddata")))
01626                {
01627                    prefix = Path.Combine(LocalCachePath, "tessdata", "fast", "script");
01628                }
01629            }
01630
01631            if (prefix == null)
01632            {
01633                string remotePath = "https://github.com/tesseract-ocr/tessdata_best/raw/main/script/"
       + languageName + ".traineddata";
01634
```

```
01635                 string localDirectory = Path.Combine(LocalCachePath, "tessdata", "best", "script");
01636
01637                 if (!Directory.Exists(localDirectory))
01638                 {
01639                     Directory.CreateDirectory(localDirectory);
01640                 }
01641
01642                 using (WebClient client = new WebClient())
01643                 {
01644                     client.DownloadFile(remotePath, Path.Combine(localDirectory, languageName +
      ".traineddata"));
01645                 }
01646
01647                 prefix = localDirectory;
01648             }
01649
01650             this.Prefix = prefix;
01651             this.Language = languageName;
01652         }
01653     }
01654 }
```

8.13 Utils.cs

```
00001 /*
00002     MuPDFCore - A set of multiplatform .NET Core bindings for MuPDF.
00003     Copyright (C) 2020  Giorgio Bianchini
00004
00005     This program is free software: you can redistribute it and/or modify
00006     it under the terms of the GNU Affero General Public License as
00007     published by the Free Software Foundation, version 3.
00008
00009     This program is distributed in the hope that it will be useful,
00010     but WITHOUT ANY WARRANTY; without even the implied warranty of
00011     MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.  See the
00012     GNU Affero General Public License for more details.
00013
00014     You should have received a copy of the GNU Affero General Public License
00015     along with this program.  If not, see <http://www.gnu.org/licenses/>
00016 */
00017
00018 using System;
00019
00020 namespace MuPDFCore
00021 {
00022     /// <summary>
00023     /// Contains useful methods.
00024     /// </summary>
00025     internal static class Utils
00026     {
00027         /// <summary>
00028         /// The factors by which we can divide a rectangle/size.
00029         /// </summary>
00030         public static readonly int[] AcceptableDivisors = new[] { 2, 3, 5, 7 };
00031
00032         /// <summary>
00033         /// Computes the biggest number smaller than or equal to the specified value that is
      factorisable using only the <see cref="AcceptableDivisors"/>.
00034         /// </summary>
00035         /// <param name="n">The maximum number.</param>
00036         /// <returns>A number that is &lt;= <paramref name="n"/> and is factorisable using only the
      <see cref="AcceptableDivisors"/>.</returns>
00037         public static int GetAcceptableNumber(int n)
00038         {
00039             for (int i = n; i >= 1; i--)
00040             {
00041                 if (IsAcceptableNumber(i))
00042                 {
00043                     return i;
00044                 }
00045             }
00046
00047             throw new ArgumentOutOfRangeException(nameof(n), n, "The number must be strictly higher
      than 0!");
00048         }
00049
00050         /// <summary>
00051         /// Determine whether a number is factorisable using only the <see
      cref="AcceptableDivisors"/>.
00052         /// </summary>
00053         /// <param name="n">The number to analyse.</param>
00054         /// <returns>A boolean value indicating whether the number is factorisable using only the <see
      cref="AcceptableDivisors"/>.</returns>
```

```
00055         public static bool IsAcceptableNumber(int n)
00056         {
00057             if (n == 0)
00058             {
00059                 return false;
00060             }
00061             else if (n == 1)
00062             {
00063                 return true;
00064             }
00065             else
00066             {
00067                 for (int i = 0; i < AcceptableDivisors.Length; i++)
00068                 {
00069                     bool divided = false;
00070 
00071                     while (n % AcceptableDivisors[i] == 0)
00072                     {
00073                         n /= AcceptableDivisors[i];
00074                         divided = true;
00075                     }
00076 
00077                     if (divided)
00078                     {
00079                         return IsAcceptableNumber(n);
00080                     }
00081                 }
00082 
00083                 return false;
00084             }
00085         }
00086 
00087         /// <summary>
00088         /// Clear all pixels outside of a specified region.
00089         /// </summary>
00090         /// <param name="image">A pointer to the address where the pixel data is stored.</param>
00091         /// <param name="imageSize">The size in pixels of the image.</param>
00092         /// <param name="imageArea">The area represented by the image.</param>
00093         /// <param name="clipArea">The region outside which all pixels will be cleared, in image
      units.</param>
00094         /// <param name="pixelFormat">The format of the pixel data.</param>
00095         public static void ClipImage(IntPtr image, RoundedSize imageSize, Rectangle imageArea,
      Rectangle clipArea, PixelFormats pixelFormat)
00096         {
00097             int clipLeft = Math.Max(0, (int)Math.Ceiling((clipArea.X0 - imageArea.X0) /
      imageArea.Width * imageSize.Width - 0.001));
00098             int clipRight = Math.Max(0, (int)Math.Floor(imageSize.Width - (imageArea.X1 - clipArea.X1)
      / imageArea.Width * imageSize.Width + 0.001));
00099 
00100             int clipTop = Math.Max(0, (int)Math.Ceiling((clipArea.Y0 - imageArea.Y0) /
      imageArea.Height * imageSize.Height - 0.001));
00101             int clipBottom = Math.Max(0, (int)Math.Floor(imageSize.Height - (imageArea.Y1 -
      clipArea.Y1) / imageArea.Height * imageSize.Height + 0.001));
00102 
00103             int pixelSize = -1;
00104             byte clearValue = 0;
00105 
00106             switch (pixelFormat)
00107             {
00108                 case PixelFormats.RGB:
00109                 case PixelFormats.BGR:
00110                     pixelSize = 3;
00111                     clearValue = 255;
00112                     break;
00113                 case PixelFormats.RGBA:
00114                 case PixelFormats.BGRA:
00115                     pixelSize = 4;
00116                     clearValue = 0;
00117                     break;
00118             }
00119 
00120             int stride = imageSize.Width * pixelSize;
00121 
00122             if (clipLeft > 0 || clipRight < imageSize.Width || clipTop > 0 || clipBottom <
      imageSize.Height)
00123             {
00124                 unsafe
00125                 {
00126                     byte* imageData = (byte*)image;
00127 
00128                     for (int y = 0; y < imageSize.Height; y++)
00129                     {
00130                         if (y < clipTop || y >= clipBottom)
00131                         {
00132                             for (int x = 0; x < imageSize.Width; x++)
00133                             {
00134                                 for (int i = 0; i < pixelSize; i++)
```

```
00135                                 {
00136                                     imageData[y * stride + x * pixelSize + i] = clearValue;
00137                                 }
00138                             }
00139                         }
00140                         else
00141                         {
00142                             for (int x = 0; x < Math.Min(clipLeft, imageSize.Width); x++)
00143                             {
00144                                 for (int i = 0; i < pixelSize; i++)
00145                                 {
00146                                     imageData[y * stride + x * pixelSize + i] = clearValue;
00147                                 }
00148                             }
00149 
00150                             for (int x = Math.Max(0, clipRight); x < imageSize.Width; x++)
00151                             {
00152                                 for (int i = 0; i < pixelSize; i++)
00153                                 {
00154                                     imageData[y * stride + x * pixelSize + i] = clearValue;
00155                                 }
00156                             }
00157                         }
00158                     }
00159                 }
00160             }
00161         }
00162 
00163         /// <summary>
00164         /// Converts an image with premultiplied alpha values into an image with unpremultiplied alpha
      values.
00165         /// </summary>
00166         /// <param name="image">A pointer to the address where the pixel data is stored.</param>
00167         /// <param name="imageSize">The size in pixels of the image.</param>
00168         public static void UnpremultiplyAlpha(IntPtr image, RoundedSize imageSize)
00169         {
00170             int stride = imageSize.Width * 4;
00171 
00172             unsafe
00173             {
00174                 byte* imageData = (byte*)image;
00175 
00176                 for (int y = 0; y < imageSize.Height; y++)
00177                 {
00178                     for (int x = 0; x < imageSize.Width; x++)
00179                     {
00180                         if (imageData[y * stride + x * 4 + 3] > 0)
00181                         {
00182                             imageData[y * stride + x * 4] = (byte)(imageData[y * stride + x * 4] * 255
      / imageData[y * stride + x * 4 + 3]);
00183                             imageData[y * stride + x * 4 + 1] = (byte)(imageData[y * stride + x * 4 +
      1] * 255 / imageData[y * stride + x * 4 + 3]);
00184                             imageData[y * stride + x * 4 + 2] = (byte)(imageData[y * stride + x * 4 +
      2] * 255 / imageData[y * stride + x * 4 + 3]);
00185                         }
00186                     }
00187                 }
00188             }
00189         }
00190     }
00191 }
```

Index